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भारतीय मानक

12 GHz बैंड में उपग्रह प्रसार प्रेषण के लिए रिसीवर की मापन पद्धतियां

भाग 2 डीबीएस ट्यूनर यूनिटों का विद्युतीय मापन

Indian Standard

METHODS OF MEASUREMENT ON RECEIVERS FOR SATELLITE BROADCAST TRANSMISSIONS IN THE 12 GHz BAND

PART 2 ELECTRICAL MEASUREMENTS ON DBS TUNER UNITS

UDC 621·396·62:621·396·946:621·317·3

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BUREAU OF INDIAN STANDARDS
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NEW DELHI 110002

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Price Group 14

Radio Communications Sectional Committee, LTD 20

NATIONAL FOREWORD

This Indian Standard which is identical with IEC Pub 1079 - 2 :1992 'Methods of measurement on receivers for satellite broadcast transmissions in the 12 GHz band Part 2 : Electrical measurement on DBS tuner unit', issued by the International Electrotechnical Commission (IEC) was adopted by the Bureau of Indian Standards on the recommendation of Radio Communications Sectional Committee (LTD 20) and approval of the Electronics and Telecommunication Division Council.

The text of the IEC standard has been aproved as suitable for publication as Indian Standard without deviations. Certain conventions are, however, not identical to those used in Indian Standards. Attention is particularly drawn to the following:

a) Wherever the words 'International Standard' appear referring to this standard, they should be read as 'Indian Standard'.

b) Comma (,) has been used as a decimal marker while in Indian Standards, the current practice is to use a point (.) as the decimal marker.

CROSS REFERENCES

In the adopted standard, reference appears to certain International Standards for which Indian Standards also exist. The corresponding Indian Standards which are to be substituted in their place are listed below along with their degree of equivalence for the editions indicated:

International Standard	*Corresponding Indian Standard*	*Degree of Equivalence*
IEC Pub 1079 - 1 : 1992 Method of measurement on receivers for satellite broadcast transmission in the 12 GHz band Part 1: Radio frequency measurements on outdoor units	IS 13986 (Part 1) : 1994 methods of measurement on receivers for satellite broadcast transmission in the 12 GHz band : Part 1 Radio frequency measurements on outdoor units	Identical
IEC Pub 569 : 1977 Informative guide for subjective tests on TV receivers	IS 9870 : 1993 Informative guide for subjective tests on TV receivers (*first revision*)	Technically equivalent

The technical committee responsible for the preparation of this standard has reviewed the provisions of the following standards and has decided that they are acceptable for use in conjunction with this standard:

1. IEC Pub 107 - 1: 1977 Recommended method of measurement on receivers for television broadcast transmission Part 1 : General considerations — Electrical measurements other than those at audio frequencies

2. CCIR Recommendation 421 — 1 : 1966 Requirement for transmission of television signals over long distances. (System I Excepted).

3. CCIR Recommendation 500 - 3: 1986 Methods for the subjective assessment of the quality of television pictures.

Only the English language text in the IEC Publication has been retained while adopting it in this standard.

Indian Standard

METHODS OF MEASUREMENT ON RECEIVERS FOR SATELLITE BROADCAST TRANSMISSIONS IN THE 12 GHz BAND

PART 2 ELECTRICAL MEASUREMENTS ON DBS TUNER UNITS

SECTION 1 - GENERAL

1.1 Scope

This part of IEC 1079 applies to the tuner unit of a receiver for the direct reception of satellite broadcast transmissions in the 12 GHz band. The channels are those defined by WARC BS-77 and RARC SAT-83 [1]* and the systems are those of CCIR Recommendation 650 [1].

The object of this part of IEC 1079 is to define the conditions and methods of measurement to be applied. This part does not specify performance requirements.

The tuner unit comprises the channel selector and FM demodulator. The input to this unit is a group of intermediate frequency signals, usually in the range 1 GHz to 2 GHz, which is provided from an associated outdoor unit. The outdoor unit includes at least a microwave antenna and the frequency converter to the first intermediate frequency.

Methods of measurement on outdoor units are described in Part 1 of International Standard IEC 1079.

A decoder for baseband and data signals may be included in the tuner unit. Methods of measurement of the decoder, however, are described in Parts 4 and 5 of International Standard IEC 1079 (under consideration).

1.2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 1079. At the time of publication, the editions indicated were valid. All normative documents are subject to revision, and parties to agreements based on this part of IEC 1079 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 107-1: 1977, *Recommended methods of measurement on receivers for television broadcast transmissions - Part 1: General considerations - Electrical measurements other than those at audio-frequencies.*

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* The figures in square brackets refer to the Bibliography (annex A).

IEC 1079: *1992, Methods of measurement on receivers for satellite broadcast transmissions in the 12 GHz band - Part 1: Radio-frequency measurements on outdoor units.*

IEC 569: 1977, *Informative guide for subjective tests on television receivers.*

CCIR Recommendation 421-1: 1966, *Requirements for the transmission of television signals over long distances (System I excepted)*

CCIR Recommendation 500-3: 1986, *Method for the subjective assessment of the quality of television pictures.*

1.3 Definitions

For the purpose of this part of IEC 1079, the following definitions apply.

1.3.1 *DBS tuner unit*

The function of this unit is to select a desired channel from a group of signals received and converted to a first intermediate frequency by the outdoor unit and to provide demodulated outputs.

The exact configuration of the unit depends on the overall product design and the related transmission standards that the equipment is designed to receive. In the description of the measurement methods, it is assumed that the arrangement of the units is similar to the notional block diagrams shown in figure 1. Examples are given of units for the MAC systems and the digital sub-carrier/NTSC system.

A decoder for the baseband signals may be incorporated in the unit or attached to it as a separate unit. In the latter case, it is assumed that the tuner unit has the following interfaces to the decoder:

a) MAC systems:
   output for MAC composite video and data signal
   output for MAC data signal (optional).

b) Digital sub-carrier/NTSC system:
   output for NTSC video signal
   output for digital sound/data signal.

1.3.2 *First intermediate frequency (first i.f.)*

The first intermediate frequency produced by the outdoor unit is usually in the band of 1 GHz to 2 GHz.

SECTION 2 - GENERAL NOTES ON MEASUREMENT

2.1 General conditions

2.1.1 *Introduction*

Measurements shall be made in accordance with the following conditions to ensure repeatable results. The methods described here assume the use of the following transmission systems: digital sub-carrier/NTSC, B-MAC, C-MAC/packet, D-MAC/packet and D2-MAC/packet. Information pertaining to these systems may be found in the references listed in annex A.

2.1.2 *Test site*

Measurements shall be carried out at a location that is not subject to external interferences from radio-frequency energy. If interference cannot be avoided, the measurements shall be carried out in a screened room.

2.1.3 *Environmental conditions*

Sections Three, Four and Five of IEC 107-1 shall be applied.

2.1.4 *Power supply*

A power supply equivalent to the rated voltage and rated frequency of the unit shall be used. The fluctuations of the power supply voltage and frequency during the tests shall not exceed ±2 % and harmonic components of the power supply shall not exceed 5 %.

2.1.5 *Accuracy of measuring instruments*

The accuracy of the measuring instruments used, if known, shall either be stated as a percentage or in decibels as appropriate. Alternatively, the precision class may be quoted as stated in the relevant publications.

2.1.6 *Stabilization period*

Unless otherwise specified, measurements should be started at the time that stabilization of the characteristics is obtained.

2.2 Video, audio and digital test signals

2.2.1 *Video test signals*

a) 50% grey level signal;

b) two riser staircase signal;

c) five riser staircase signal followed by grey signals;

d) ten riser staircase signal with colour sub-carrier followed by grey signals (digital sub-carrier/NTSC system only);

e) eight riser staircase signal with 6 MHz sinewave followed by grey signals (MAC systems only);

f) composite sinewave signal (sinewave on 50 % grey level signal);

g) 1 µs pulse on black and on 50 % grey level signals;

h) VIR signal (colour bar at 70 % level plus 50 % luminance bar) (digital sub-carrier/NTSC system only);

i) complex wobbulation signal - imaginary part (MAC systems only);

j) complex wobbulation signal - real part (MAC systems only);

k) rising ramp signal (MAC systems only);

l) pulse and bar signal for K-rating measurements;

m) field frequency square wave signal.

Examples are shown in figure 2. The waveforms a) to c), f), g) and l) are directly applicable to the digital subcarrier/NTSC system. For the MAC systems, it is necessary to change the level of the line blanking interval and to insert the data burst.

NOTES

1 The levels of the signals are expressed as a percentage of the difference between the black level and white level.

2 The grey signals in the waveforms c), d) and e) are used to change the average picture level (APL) in the range of 10 % to 90 %.

3 The digital sub-carrier/NTSC test signals include a composite sync component. The MAC test signals include a data burst in the line blanking interval. To avoid the necessity of recovering the MAC sync signal from the data burst, line and field sync pulses may be provided from the test signal generator directly to the measuring instruments, bypassing the equipment under test.

2.2.2 *Audio test signals*

Since all the systems covered by this part of IEC 1079 use digital modulation for sound transmission and as this part is only concerned with the signals at the FM demodulator, there is no specific requirement for audio modulation. However, where it is convenient to apply such modulation, a 1 kHz sinewave signal should be used.

2.2.3 *Data signal content*

The systems covered by this part of IEC 1079 all include a digital component. The methods of measurement related to these digital signals are included in IEC 1079. When a digital component is included in a test signal for use with this part, the data shall consist of a suitable pseudo random binary sequence whose characteristics shall be stated with the results.

2.3 Radio-frequency input signals

2.3.1 *Input signals*

The following radio-frequency input signals shall be used:

a) unmodulated carrier signal;

b) carrier signals modulated by the test signals for the system in use.

Unless otherwise specified, the carrier frequencies shall be selected from the relevant first intermediate frequencies corresponding to the satellite broadcast channels which are specified by the system standards for which the equipment under test is designed.

2.3.2 *Input signal levels*

Input signal levels to a tuner unit shall be expressed in terms of available power level in dB(mW).

2.3.3 *Setting of input signal level*

Input signal levels should be specified for unmodulated carriers even when modulated carriers are used. The level setting can be done with a spectrum analyzer.

2.4 Reference signals

2.4.1 *Reference video signal*

For the measurements of noise and interference, a composite sinewave signal as shown in figure 2 f) shall be used. The frequency of the sinewave is set at the frequency (f_0) shown in table 1.

The frequency (f_0) corresponds to the 0 dB reference frequency of the pre-emphasis network.

Table 1 – Frequencies for reference video signals

System	^{o} MHz
Digital sub-carrier/NTSC	0,75
B-MAC	2,64
C-MAC D2-MAC D-MAC	1,37

2.4.2 *Reference audio signal*

a) Digital sub-carrier/NTSC system

A 1 kHz sinewave signal at a level corresponding to full scale minus 18 dB in digital coding shall be used.

b) MAC systems

The data burst carrying a pseudo random binary sequence shall be used.

2.5 Standard measuring conditions

Unless otherwise specified, the following conditions apply:

a) Audio input signal: none
b) Digital sub-carrier in the digital sub-carrier/NTSC system: off

c) Energy dispersal signal: none
d) MAC system data burst: on

The data burst includes sync information.

The input signal is applied to the DBS tuner unit through a coupling network specified in 2.6.7 and the video output signal is measured through a lowpass filter specified in 2.6.10.

2.6 Measuring instruments

2.6.1 *Test signal generator*

The test generators shall be capable of providing baseband video signals as specified in 2.2.1. For digital sub-carrier/NTSC signals, a suitably modulated sub-carrier shall also be included. For MAC test signals, when data burst is included, it shall include line synchronization and a pseudo random binary sequence.

2.6.2 *First i.f. modulator*

The first i.f. modulator shall be capable of frequency modulating the first i.f. carrier corresponding to the carrier of each broadcast channel in the 12 GHz band with the baseband signal provided by the test signal generator in accordance with the system tested. It should have a maximum output level of –20 dB(mW) and provide an on/off switch for an energy dispersal signal.

Notional block diagrams of the modulators are shown in figure 3.

2.6.3 *C.W. signal generator*

The c.w. signal generator shall be capable of generating stable radio-frequency signals in the frequency band of 26 MHz to 7 000 MHz with a maximum output level of –10 dB(mW).

2.6.4 *SWR bridge*

An SWR bridge for the i.f. band should be used. The nominal impedance of the SWR bridge shall be equal to that of the i.f. input of the tuner under test.

2.6.5 *Spectrum analyzer*

The spectrum analyzer should have a frequency range of 26 MHz to 7 000 MHz.

2.6.6 *Directional coupler*

The directional coupler should have a coupling factor of about 3 dB and a directivity better than 20 dB in the i.f. band.

2.6.7 *Input coupling network*

When connecting an i.f. signal source to the input terminal of a tuner unit, it is necessary to block the d.c. power supply voltage for an associated outdoor unit. The input coupling network shall be a coaxial line in which a capacitor is directly inserted into the centre conductor of the line.

2.6.8 *Bias network*

See IEC 1079, Part 1.

2.6.9 *Bandpass filter*

When interference ratios in the video signal are measured, the wanted signal is modulated by the reference video signal specified in 2.4.1 and a bandpass filter is used to eliminate random noise included in the output signal.

The filter should have a 3 dB bandwidth of about 200 kHz centred at the frequency specified in table 1.

An example of the circuit and its frequency characteristics is shown in figure 4.

2.6.10 *Lowpass filter*

For the measurements of video baseband signals at the output of the tuner, the lowpass filter specified in the system standard shall be used. An example is shown in figure 5.

2.6.11 *Variable bandpass filter*

See 3.10.2.2, note 1.

2.6.12 *Video noise meter*

The video noise meter shall be capable of measuring the noise component of a grey level signal and provide an output terminal for this component. The noise meter is also used as an amplifier for frequency components superimposed on the grey level signal. Its bandwidth shall be in accordance with the system in use.

2.6.13 *Group delay measuring instrument*

See 3.13.1.

2.6.14 *Video monitor*

This monitor is used to perform subjective evaluations. It should include an appropriate decoder for the system in use.

SECTION 3 - METHODS OF MEASUREMENT

3.1 Impedance matching at input terminal

3.1.1 *Introduction*

This test measures the extent of impedance matching of the input terminal. A c.w. signal is applied to the input terminal and levels of the direct and reflected signals are measured using an SWR bridge. Return loss is calculated from the two signal levels.

3.1.2 *Method of measurement*

Measurement shall be made according to the following conditions and procedure. Arrangement of the test equipment is shown in figure 6.

3.1.2.1 *Measuring conditions*

a) Test frequency: centre frequency of each channel in the first i.f. band.

b) Test signal level: –30 dB(mW).

3.1.2.2 *Measurement procedure*

a) Apply a c.w. signal with a test frequency as specified above, then set the level at the output terminal of the SWR bridge by adjusting the variable attenuator (see figure 6).

b) Short the test terminal of the bridge with a short-circuit termination and measure the output signal level L_{P_0} dB(mW).

c) Connect the test terminal to the input terminal of the indoor unit under test and measure the output signal level L_P dB(mW).

d) Calculate the return loss by the following equation:

$$\text{return loss} = L_{P_0} - L_P \text{ (dB)}$$

e) Change the test signal frequency and repeat a) to d) in the same way.

3.1.3 *Presentation of results*

The results shall be listed in a table and/or presented graphically.

3.2 Signal-to-noise ratio of video signal (unweighted)

3.2.1 *Introduction*

This test measures the signal-to-noise ratio of a video output signal when the first i.f. input signal contains random noise.

The signal-to-noise ratio of the input i.f. signal is measured with various carrier-to-noise ratios (C/N).

3.2.2 *Method of measurement*

Measurement shall be made according to the following conditions and procedure. Arrangement of the test equipment is shown in figure 7.

3.2.2.1 *Measuring conditions*

a) Test channel: the centre channel in the first i.f. band.

b) Test signal level: –30 dB(mW), –45 dB(mW) and –60 dB(mW).

c) Test video signal: 50 % grey level signal.

d) C/N of input i.f. signal : 4 dB to 24 dB in 1 dB steps.

e) All other measuring conditions are standard (see 2.5).

3.2.2.2 *Measurement procedure*

a) Apply an unmodulated i.f. signal to the unit under test and set the signal level at one of the values specified above.

b) Apply white noise to the unit through a power combiner together with the signal and set the C/N at 24 dB (see figure 7).

c) Modulate the i.f. signal with the test video signal and measure the unweighted signal-to-noise ratio using a video noise meter.

d) Repeat a) to c) at the other specified signal levels and C/N values in the same way.

3.2.3 *Presentation of results*

The results shall be listed in a table or presented graphically. A graphical example is shown in figure 8. In the case of MAC signals, it shall be noted with the results that they refer to measurement of the compressed video signal.

3.3 Truncation noise

3.3.1 *Introduction*

This subjective test assesses truncation noise in the picture caused by the presence of fast transitions associated with amplitude peaks at white level in the video signal.

The assessment uses a modulated first i.f. signal.

In the case of the digital sub-carrier/NTSC system, truncation noise in the sound is also assessed.

3.3.2 *Method of measurement*

Measurement shall be made according to the following conditions and procedure. Arrangement of the test equipment is shown in figure 9.

3.3.2.1 *Measuring conditions*

a) Test channel: the centre channel in the first i.f. band.

b) Test signal level: –45 dB(mW).

c) Video test signal:

- for the NTSC system:

  1 µs pulse on black level signal and 1 µs pulse on 50 % grey level signal. In both cases the peak pulse level shall be variable over the range 90 % to 140 %;

- for MAC systems: under consideration.

d) Digital sub-carrier: present (digital sub-carrier/NTSC system only).

e) Audio test signal: reference audio signal (digital sub-carrier/NTSC system only).

f) Energy dispersal signal: on.

g) All other measuring conditions are standard (see 2.5).

3.3.2.2 *Measurement procedure*

a) Apply an unmodulated i.f. signal to the unit under test and set the input signal level at the specified value.

b) Modulate the i.f. signal at 90 % peak value with a 1 µs pulse on 50 % grey level and in the case of the digital sub-carrier/NTSC system with the reference audio signal.

c) Increase the peak level of the modulating video signal gradually up to 140 % and note the amplitude at which truncation noise is just perceptible on the video monitor. In the digital sub-carrier/NTSC system, also note the amplitude at which truncation noise is just perceptible in the sound output.

d) Repeat a) to c) with the video signal set to black level.

3.3.3 *Presentation of results.*

The results shall be listed in a table.

For precise results, the assessment conditions given in CCIR Recommendation 500-3 should be observed.

3.4 **Input signal level to output signal level characteristics**

3.4.1 *Introduction*

This test measures variations of output signal levels delivered by the FM demodulator due to changes of the input i.f. signal level.

3.4.2 *Method of measurement*

Measurement shall be made according to the following conditions and procedure. Arrangement of the test equipment is shown in figure 10.

3.4.2.1 *Measuring conditions*

a) Test channel: the centre channel in the first i.f. band.

b) Test signal level: –25 dB(mW) to –65 dB(mW) in 5 dB steps.

c) Video test signal: two, five or eight riser staircase signal (average picture level, APL 50 %).

d) All other measuring conditions are standard (see 2.5).

3.4.2.2 *Measurement procedure*

a) Apply an i.f. signal modulated with the video signal to the unit under test at an input signal level of –65 dB(mW) and measure the peak-to-peak amplitude of the video output signal.

b) Repeat a) at other input signal levels.

3.4.3 *Presentation of results*

The results shall be listed in a table or presented graphically.

NOTE - In some cases, the effects of threshold noise may obscure changes in video output signal amplitude.

3.5 Co-channel c.w. interference ratio

3.5.1 *Introduction*

This test measures the signal-to-interference ratio for co-channel c.w. interference at the first i.f. The measurement is made by applying both wanted and unwanted i.f. signals in the same channel simultaneously to the unit under test and measuring the beat frequency components appearing in the video output. The interference ratio is expressed as the ratio of the desired signal level to that of the beat components at the video output.

NOTES

1 The value required to achieve a given degree of picture impairment can only be determined by subjective tests.

2 In some cases, the interference ratio is expressed as a ratio of the wanted to unwanted signals at the input to give a specified interference ratio at the video output or a given degree of picture impairment. A result, expressed in terms of input ratio, can be derived from the results of the method described in 3.5.2.

3.5.2 *Method of measurement*

Measurement shall be made according to the following conditions procedure. Arrangement of the test equipment is shown in figure 11.

3.5.2.1 *Measuring conditions*

a) Test channel: the centre channel in the first i.f. band.

b) Frequencies of the first i.f. signals:

Wanted signal: nominal
Unwanted signal: variable (c.w.).

c) Test signal levels:

Wanted signal: –45 dB(mW)

Unwanted signal: –50 dB(mW) to –80 dB(mW) in 10 dB steps.

d) Video test signals:

Wanted signal: reference video signal and 50 % grey level signal.

Unwanted signal: none.

e) All other measuring conditions are standard (see 2.5).

3.5.2.2 *Measurement procedure*

a) Apply the wanted i.f. signal modulated with the reference video signal to the unit under test at an input signal level of –45 dB(mW) and measure the level of the sinewave component of the video output signal through the bandpass filter specified in 2.6.9 and note the level as $L_{\mathrm{P}0}$ dB(mW).

b) Apply the wanted i.f. signal modulated with the grey level signal and the unwanted i.f. signal to the unit simultaneously through a power combiner and adjust the frequency of the unwanted signal so as to obtain the maximum level of beat components at the output of the bandpass filter and note the level as L_{P} dB(mW).

c) Calculate the co-channel interference ratio by the following equation:

$$\text{co-channel interference ratio} = L_{\mathrm{P}0} - L_{\mathrm{P}} + 8\ \text{dB}$$

d) Repeat b) and c) at other input levels of the unwanted signal.

NOTE - The figure of 8 dB converts the modulation factor of the sinewave to that of 100 % video signal.

3.5.3 *Presentation of results*

The results shall be listed in a table or presented graphically.

3.6 Adjacent channel interference ratio

3.6.1 *Introduction*

This test measures the signal to interference ratio of adjacent or next adjacent channel interference in the first i.f. channels. The measurement is made by applying the wanted and unwanted i.f. signals simultaneously to the unit under test and measuring interference components appearing in the video band. The interference ratio is defined as the ratio of the desired signal power to the power of the interference components at the video output.

NOTE - The value required to achieve a given degree of picture impairment can only be determined by subjective tests.

3.6.2 *Method of measurement*

Measurement shall be made according to the following conditions and procedure. Arrangement of the test equipment is shown in figure 12.

3.6.2.1 *Measuring conditions*

a) Test channels:

Wanted channel: the centre channel in the first i.f. band

Unwanted channel: a lower or an upper channel adjacent to or next adjacent relative to the wanted channel.

b) Frequencies of the first i.f. signal: nominal.

c) Test signal levels:

Wanted channel: –45 dB(mW)

Unwanted channel: –45 dB(mW) to –65 dB(mW) in 5 dB steps.

d) Video test signals:

Wanted channel: reference video signal and 50 % grey level signal

Unwanted channel: sinewave signal equal to f_0 (see table 1) at a modulation level of 77 % relative to that of the nominal video signal.

e) All other measuring conditions are standard (see 2.5).

3.6.2.2 *Measurement procedure*

a) Apply the wanted i.f. signal modulated with the reference video signal to the unit under test at an input signal level of –45 dB(mW) and measure the level of the sinewave component of the video output signal through the bandpass filter specified in 2.6.9 and note the level as L_{P_0} dB(mW).

b) Apply the wanted i.f. signal and the unwanted signal of an adjacent or a next adjacent channel to the unit simultaneously through a power combiner and set the levels of both wanted and unwanted signals at –45 dB(mW).

c) Modulate the wanted signal with the 50 % grey signal and the unwanted signal with the sinewave signal and measure the level of the output of the bandpass filter and note as L_{P} dB(mW).

d) Calculate the adjacent channel interference ratio by the following equation:

$$\text{adjacent (or next adjacent) channel interference ratio} = L_{\mathrm{P}_0} - L_{\mathrm{P}} + 8\ \text{dB}$$

e) Repeat b) to d) at other unwanted signal levels and channels.

NOTE - The figure of 8 dB converts the modulation factor of the sinewave to that of 100 % video signal.

3.6.3 *Presentation of results*

The results shall be listed in a table or presented graphically.

3.7 **Intermodulation interference ratio**

3.7.1 *Introduction*

This test measures interference components due to intermodulation of the first i.f. channels. The measurement is made by applying two unwanted i.f. signals together with a wanted i.f. signal to the unit under test and measuring beat frequency components appearing in the video output.

3.7.2 *Method of measurement*

Measurement shall be made according to the following conditions and procedure. Arrangement of the test equipment is shown in figure 13.

3.7.2.1 *Measuring conditions*

a) Test channels:

Wanted channel: the centre channel in the first i.f. band

Unwanted channel: channels higher and lower by two and four channel spacings from the wanted channel. The channels are taken in pairs, both higher and both lower than the wanted channel,

b) Frequencies of the first i.f. signals·

Wanted channel: nominal

Unwanted channel: variable (c.w.).

c) Test signal levels:

Wanted channel: –45 dB(mW)

Unwanted channel: –10 dB(mW) to –45 dB(mW) in 5 dB steps.

d) Video test signals:

Wanted channel: reference video signal and 50 % grey level signal

Unwanted channel: none.

e) All other measuring conditions are standard (see 2.5).

3.7.2.2 *Measurement procedure*

a) Apply the wanted i.f. signal modulated with the reference video signal to the unit under test at an input signal level of –45 dB(mW) and measure the level of the sinewave component of the video output signal through the bandpass filter specified in 2.6.9 and note the level as L_{P_0} dB(mW).

b) Apply the two unwanted i.f. signals at the same level of –45 dB(mW) to the unit together with the wanted signal modulated with the 50 % grey signal through power combiners and adjust the frequency of the unwanted signals so as to obtain maximum output of beat components at the output of the bandpass filter and note the level as L_P dB(mW).

c) Calculate the intermodulation interference ratio by the following equation:

$$\text{intermodulation ratio} = L_{P_0} - L_P + 8 \text{ dB}$$

d) Repeat b) and c) at other levels of the unwanted signals.

NOTE · The figure of 8 dB converts the modulation factor of the sinewave to that of 100 % video signal.

3.7.3 *Presentation of results*

The results shall be listed in a table or presented graphically.

3.8 Image frequency interference ratio - second i.f.

3.8.1 *Introduction*

This test measures interference due to unwanted signals corresponding to the second i.f. image frequencies. The measurement is made by applying the first i.f. signal and its image frequency signal to the unit under test simultaneously and measuring beat frequency components that appear in the video output.

3.8.2 *Method of measurement*

Measurement shall be made according to the following conditions and procedure. Arrangement of the test equipment is shown in figure 14.

3.8.2.1 *Measuring conditions*

a) Test channels: the lowest, the centre and the highest channels in the first i.f. band.

b) Frequencies of the first i.f. and its image signals:

Wanted signals: nominal

Image signals: variable (c.w.).

c) Test signal levels:

Wanted signal: −45 dB(mW)

Image signal: −10 dB(mW) to −45 dB(mW) in 5 dB steps.

d) Video test signals:

Wanted signal: reference video signal and 50 % grey level signal

Image signal: none.

e) All other measuring conditions are standard (see 2.5).

3.8.2.2 *Measurement procedure*

a) Apply the wanted i.f. signal modulated with the reference video signal to the unit under test at an input signal level of −45 dB(mW) and measure the level of the sinewave component of the output video signal through the bandpass filter specified in 2.6.9 and note the level as L_{P_0} dB(mW).

b) Apply the image signal at a level of −45 dB(mW) to the unit together with the wanted signal modulated with the 50 % grey signal through a power combiner and adjust the frequency so as to obtain maximum output of the bandpass filter and note the level as L_P dB(mW).

c) Calculate the image interference ratio by the following equation:

$$\text{image interference ratio} = L_{P_0} - L_P + 8\ \text{dB}$$

d) Repeat a) to c) at other input levels of the image signal and other test channels.

NOTE - The figure of 8 dB converts the modulation factor of the sinewave to that of 100 % video signal.

3.8.3 *Presentation of results*

The results shall be listed in a table or presented graphically.

3.9 **Impairment due to spurious responses**

3.9.1 *Introduction*

This subjective test measures impairment due to unwanted signals other than co-channels and those in adjacent, next adjacent and image frequency channels. The measurement is made by applying the wanted and unwanted signals to the unit under test simultaneously and measuring the level of the unwanted signal relative to that of the wanted signal to give just perceptible degradation of the picture.

3.9.2 *Method of measurement*

Measurement shall be made according to the following conditions and procedure. Arrangement of the test equipment is shown in figure 15.

3.9.2.1 *Measuring conditions*

a) Test channels: the lowest, the centre and the highest channels in the first i.f. band.

b) Unwanted signal frequencies: from 26 MHz to 7 GHz, except the first i.f. band.

c) Test signal level:

Wanted signal: –45 dB(mW)

Unwanted signal: less than –10 dB(mW).

d) Test video signal:

Wanted signal: VIR signal for digital sub-carrier/NTSC system and colour bar signal for MAC system

Unwanted signal: none.

e) All other measuring conditions are standard (see 2.5).

3.9.2.2 *Measurement procedure*

a) Apply the wanted i.f. signal modulated with the signal appropriate to the system in use to the unit under test at an input signal level of –45 dB(mW).

b) Add the unwanted signal through a power combiner

c) Observe the video on a picture monitor with a decoder connected to the output of the unit and change the frequency and level of the unwanted signal.

d) If impairment is observed, note the frequency and the level at which the impairment becomes just perceptible.

e) Calculate the interference ratio from the level difference between the unwanted and wanted signals at the i.f. input.

f) Repeat a) to e) at other wanted channels.

NOTE - Interference ratios larger than 40 dB may be ignored.

3.9.3 *Presentation of results*

The results shall be listed in a table or presented graphically. A graphical example is shown in figure 16.

3.10 Stability of local oscillator frequency

3.10.1 *Introduction*

This test measures variations in the frequency of the local oscillator caused by changes in temperature and mains voltage. The frequency variations are measured using the leakage power of the local oscillator that appears at the first i.f. input terminal of the unit under test. To permit any automatic frequency control to operate normally, a first i.f. signal is also applied to the unit.

3.10.2 *Method of measurement*

Measurement shall be made according to the following conditions and procedure. Arrangement of the test equipment is shown in figure 17.

3.10.2.1 *Measuring conditions*

a) Test channels: the lowest, the centre and the highest channels in the first i.f. band.

b) Test signal level: –45 dB(mW).

c) Video test signal: two, five or eight riser staircase signal (APL 50 %).

d) Environmental temperature: 0 °C, 20 °C and 40 °C.

e) Mains voltage: rated and ±10 %.

f) All other measuring conditions are standard (see 2.5).

3.10.2.2 *Measurement procedure*

a) Set switches 1 and 2 to position 1 and apply the unmodulated i.f. signal of a channel to the unit under test and set the input signal level at –45 dB(mW), the environmental temperature at 20 °C and the mains voltage at the rated value.

b) Tune the unit to the signal.

c) Modulate the signal with the staircase signal and change switch 1 to position 2 and tune the variable bandpass filter to the local oscillation frequency.

d) Change switch 2 to position 2 and measure the frequency.

e) Repeat a) to d) at other channels, temperatures and mains voltages.

NOTES

1 The variable bandpass filter has a bandwidth of about 20 MHz and is tunable in the frequency range of the second local oscillator.

2 The measurement should be started at least 1 min after the power switch of the unit is on.

3 If the spectrum analyzer can measure the frequency directly, the bandpass filter and the amplifier are not needed.

3.10.3 *Presentation of results*

The results shall be listed in a table or presented graphically. A graphical example is shown in figure 18.

3.11 AFC characteristics of local oscillator

3.11.1 *Introduction*

This test measures the performance of the AFC characteristics of the local oscillator in the unit under test. The characteristics are measured by observing the variation of local oscillation frequency due to changes in the frequency of the first i.f. signal.

3.11.2 *Measurement*

Measurement shall be made according to the following conditions and procedure. Arrangement of the test equipment is shown in figure 19.

3.11.2.1 *Measuring conditions*

a) Test channels: the lowest, the centre and the highest channels in the first i.f. band.

b) Test signal level: –45 dB(mW).

c) Video test signal: two, five or eight riser staircase signal (APL 50 %).

d) All other measuring conditions are standard (see 2.5).

3.11.2.2 *Measurement procedure*

a) Set switches 1 and 2 to position 1 and apply the unmodulated i.f. signal to the unit under test and set the input signal level at –45 dB(mW).

b) Change switch 2 to position 2 and measure the frequency of the i.f. signal.

c) Modulate the i.f. signal with the staircase signal and set switch 1 to position 2 and switch 2 to position 1.

d) Tune the variable bandpass filter to the local oscillation frequency and then change switch 2 to position 2 and measure the frequency.

e) Calculate the second i.f. frequency as the frequency difference between the test and local oscillation frequencies.

f) Repeat a) to e) at several first i.f. frequencies within ± 20 MHz of nominal first i.f. frequency in 2 MHz steps.

g) Repeat the above measurements at other test channels.

NOTES

1 For the variable bandpass filter, see 3.10.2.2, note 1.

2 If a hysteresis appears in the characteristics, the measurement should be made of the characteristics of both the pull-in and hold ranges.

3 If the spectrum analyzer can measure the frequency directly, the bandpass filter and the amplifier are not needed.

3.11.3 *Presentation of results*

The results shall be listed in a table or presented graphically. A graphical example is shown in figure 20.

3.12 Amplitude/frequency response of video channel

3.12.1 *Introduction*

This test measures the video amplitude/frequency response of the unit under test at demodulated output.

3.12.2 *Method of measurement*

Measurement shall be made under the following conditions and procedure. Arrangement of the test equipment is shown in figure 21.

3.12.2.1 *Measuring conditions*

a) Test channel: the centre channel of the first i.f. band.

b) Test signal level: –45 dB(mW).

c) Video test signal: composite sinewave video signal with the sinewave component extending over the following frequency range:

digital sub-carrier/NTSC systems: 60 Hz to 6 MHz
MAC systems: 50 Hz to 10 MHz.

NOTE - In the case of MAC systems, test signals carrying a complex wobbulation may be used for automatic measurements.

d) All other measuring conditions are standard (see 2.5).

3.12.2.2 *Measurement procedure*

a) Apply the i.f. signal modulated with the video signal specified above to the unit under test at an input signal level of –45 dB(mW) and measure the level of the sinewave component at the video output by changing the sinewave frequency over the specified range.

b) Calculate the level difference relative to that at a frequency of 100 kHz.

3.12.3 *Presentation of results*

The results shall be listed in a table or presented graphically. A graphical example is shown in figure 22.

3.13 Group delay characteristics of video channel

3.13.1 *Introduction*

Several techniques are available for the measurement of group delay, all requiring rather specific measuring instruments. However, the principle of the operation is the same, in that the test signal comprises a variable frequency signal that is modulated by a fixed lower frequency reference. This reference is subjected to the same delays as the test signal but, because the reference has a fixed frequency, its delay is easy to measure.

For the measurement of the group delay of the video channel, a variable frequency sinewave, modulated by a reference frequency, is superimposed on a composite grey level signal. The frequency of the sinewave is variable over the band from 200 kHz to either 6 MHz or 10 MHz. The frequency of the reference shall be 20 kHz.

3.13.2 *Method of measurement*

Measurement shall be made according to the following conditions and procedure. Arrangement of the test equipment is shown in figure 23.

3.13.2.1 *Measuring conditions*

a) Test channel: the centre channel of the first i.f. band.

b) Test signal level: –45 dB(mW).

c) Video test signal: composite sinewave video signal with the sinewave component over the following frequency range:

digital sub-carrier/NTSC systems: 200 kHz to 6 MHz
MAC systems: 200 kHz to 10 MHz.

NOTE - In the case of MAC systems, test signals carrying a complex wobbulation may be used for automatic measurement.

d) All other measuring conditions are standard (see 2.5).

3.13.2.2 *Measurement procedure*

a) Apply the i.f. signal modulated with the video signal specified above to the unit under test at an input signal level of –45 dB(mW) and measure the group delay at the signal output when changing the sinewave frequency over the specified range.

b) Calculate the group delay difference relative to that at a frequency of 200 kHz.

3.13.3 *Presentation of results*

The results shall be listed in a table or presented graphically. A graphical example is shown in figure 24.

3.14 **Linear waveform response of video channel**

3.14.1 *Introduction*

This test measures the video signal linear waveform response characteristics of the unit under test using a specified limited spectrum test signal and an oscilloscope with the appropriate graticule. The results are expressed as a percentage of the difference between black level and white level. A rating factor *K* is used in some cases which allows for the differing subjective effects of various distortions.

3.14.2 *Method of measurement*

Measurement shall be made according to the following conditions and procedure. Arrangement of the test equipment is shown in figure 25.

3.14.2.1 *Measuring conditions*

a) Test channel: the centre channel of the first i.f. band.

b) Test signal level: –45 dB(mW).

c) Video test signal (line time):

Pulse and bar signals:

In the case of the digital sub-carrier/NTSC system, 2 *T* pulses have a half-amplitude duration of 2 *T* (where *T* = 125 ns) and bar transition of 2 *T*. In the case of MAC systems, 6 *T* pulses have a half-amplitude duration of 2,4 *T* (where *T* = 49,4 ns) and a total duration of 6 *T*. Bar transitions have a duration of 4 *T*. Waveforms of 2 *T* and 6 *T* are indicated in figure 26. For further details, see relevant CCIR texts.

d) Video test signal (field time):

Field frequency square wave signal.

e) All other measuring conditions are standard (see 2.5).

3.14.2.2 *Measurement procedure*

Apply the i.f. signal modulated with the video test signal to the unit under test at an input signal level of –45 dB(mW) and measure the respective characteristics at the video output.

i) *Bar response*

a) Adjust the oscilloscope as shown in figure 26, so that the half-amplitude points of the bar transitions coincide with points m_1 and m_2.

b) Set points A and B, respectively, at black level and mid-point of the bar at unit-amplitude.

c) Measure the maximum departure, *b*, of the bar from unit-amplitude between points extending to 1 % of a horizontal period from the half-amplitude points of each transition and express it as a percentage of the difference between black level and white level.

d) For the digital sub-carrier/NTSC system, calculate the rating factor *K* by the following expression:

$$K = | b - 100 |$$

For MAC systems, the definition of the rating factor *K* is under consideration.

ii) *Pulse response*

a) Adjust the oscilloscope as shown in figure 27 such that the sweep velocity corresponds with the time scale indicated, the black level of the response coincides with the horizontal axis, the peak of the response falls on the unit-amplitude line and the half-amplitude points of the response are symmetrically disposed about the vertical axis.

b) Measure the amplitude of the signal at the indicated points on the horizontal axis and express it as a percentage, *b*, of the peak response. In the case of MAC signals, measure the departure between the amplitude of the signal and the nominal amplitude and express it as a percentage of the peak response.

c) Measure the difference in time, *a*, between the half-amplitude points of the response and express it in nanoseconds.

d) For the digital sub-carrier/NTSC system, calculate the rating factor *K* by the following expression:

K rating of 2 *T* pulse half-amplitude duration, *a*, in the same units as *T*:

$$K = \left| \frac{a - 2\,T}{10\,T} \right|$$

Points on time axis and unit intervals	*K rating as a function of percentage of peak response b*
±1	$K = \left\| \frac{b}{400} \right\|$
±2	$K = \left\| \frac{b}{200} \right\|$
±4	$K = \left\| \frac{b}{100} \right\|$

For MAC systems, the definition of the rating factor *K* is under consideration.

iii) *Pulse/bar rating*

a) Adjust the oscilloscope as shown in figure 26.

b) Measure the ratio of the amplitude of the pulse to the amplitude of the bar response at point B.

c) For the digital sub-carrier/NTSC system, calculate the rating factor *K* by the following expression:

$$K = \left| \frac{100 - b}{4\,b} \right|$$

For MAC systems, the definition of the rating factor *K* is under consideration.

iv) *Field frequency square wave response*

a) Adjust the oscilloscope, as shown in figure 28, so that the half-amplitude points of the bar transmissions coincide with points m_1 and m_2, and so that the mid-points of the positive and negative excursions correspond with points A and B.

b) Adjust the display so that points A and B correspond to the unit-amplitude, the synchronizing pulses being ignored.

c) Measure the maximum departure, b, of the bar amplitude above and below the unit-amplitude level B between points 0,01 V from the half-amplitude points of each transition and express it as a percentage of unit-amplitude (V is the duration of one vertical field).

d) For the digital sub-carrier/NTSC system, calculate the rating factor K by the following expression:

$$K = \left| \frac{b - 100}{2} \right|$$

For MAC systems, the definition of the rating factor K is under consideration.

3.14.3 *Presentation of results*

The results shall be presented using the rating factor K. Alternatively, photographic records of the waveforms may be used.

3.15 Line time amplitude linearity of video signal

3.15.1 *Introduction*

This test measures the amplitude linearity of the output signal at frequencies above the line scanning rate.

3.15.2 *Method of measurement*

Measurement shall be made according to the following conditions and procedure. Arrangement of the test equipment is shown in figure 29.

3.15.2.1 *Measuring conditions*

a) Test channel: the centre channel in the first i.f. band.

b) Test signal level: –45 dB(mW).

c) Video test signal: five or eight riser staircase signal at 10 %, 50 % and 90 % APL.

NOTE - In the case of MAC signals, a rising ramp may be used for automatic measurements.

d) All other measuring conditions are standard (see 2.5).

3.15.2.2 *Measurement procedure*

a) Apply the i.f. signal modulated with the five or eight riser staircase signal at 50 % APL to the unit under test at an input level of –45 dB(mW) and measure the amplitude of each step of the output signal.

b) Calculate the departure from the nominal amplitude of each step as a percentage of the difference between black level and white level. If a rising ramp is used, calculate the maximum value of the departure from the nominal value.

c) Repeat a) and b) with the staircase signal at 10 % and 90 % APL.

3.15.3 *Presentation of results*

The results shall be listed in a table.

3.16 Differential gain and differential phase characteristics with respect to the chrominance sub-carrier

3.16.1 *Introduction*

This test measures the differential gain and differential phase characteristics of the composite colour signal at the output.

This test applies only to the digital sub-carrier/NTSC system.

3.16.2 *Method of measurement*

Measurement shall be made according to the following conditions and procedure. Arrangement of the test equipment is shown in figure 30.

3.16.2.1 *Measuring conditions*

a) Test channel: the centre channel in the first i.f. band.

b) Test signal level: -45 dB(mW).

c) Video test signal: ten riser staircase signals at 10 %, 50 % and 90 % APL with chrominance sub-carrier.

d) All other measuring conditions are standard (see 2.5).

3.16.2.2 *Measurement procedure*

a) Apply the unmodulated i.f. signal to the unit under test and set the input signal level at -45 dB(mW).

b) Modulate the staircase signal at 10 % APL and measure the differential gain and differential phase at the output signal.

c) Repeat b) at 50 % and 90 % APL.

3.16.3 *Presentation of results*

The results shall be listed in a table or presented graphically. Graphical examples are shown in figure 31.

3.17 Intermodulation between sound sub-carrier and chrominance sub-carrier

3.17.1 *Introduction*

This test measures interference in the video signal due to intermodulation between the sound and chrominance sub-carriers. This test applies only to the digital sub-carrier/NTSC system.

3.17.2 *Method of measurement*

Measurement shall be made according to the following conditions and procedure. Arrangement of the test equipment is shown in figure 32.

3.17.2.1 *Measuring conditions*

a) Test channel: the centre channel in the first i.f. band.

b) Test signal levels: –30 dB(mW), –45 dB(mW) and –60 dB(mW).

c) Video test signal: composite sinewave signal using chrominance sub-carrier at 90 % level.

d) Digital sub-carrier: present.

e) All other measuring conditions are standard (see 2.5).

3.17.2.2 *Measurement procedure*

a) Apply the i.f. signal modulated with the composite sinewave signal to the unit under test at an input signal level of –45 dB(mW) and measure the intermodulation frequency components that appear at the output.

b) Calculate the level difference relative to the chrominance sub-carrier component for each intermodulation component.

c) Repeat a) and b) at other input signal levels.

NOTE - Unwanted components may include the second and the third order intermodulation components. Frequencies of the components can be calculated by the following equations:

$$f_2 = f_d - f_c$$

$$f_3 = 2f_c - f_d$$

where:

f_2 is the frequency of the second order intermodulation;

f_3 is the frequency of the third order intermodulation;

f_d is the frequency of the digital sub-carrier;

f_c is the frequency of the chrominance sub-carrier.

3.17.3 *Presentation of results*

The results shall be listed in a table or presented graphically. A graphical example is shown in figure 33.

3.18 Suppression of energy dispersal signal

3.18.1 *Introduction*

This test measures the suppression ratio of the energy dispersal signal at the video output of the unit under test.

NOTE - This function is often included in the decoder.

3.18.2. *Method of measurement*

Measurement shall be made according to the following conditions and procedure. Arrangement of the test equipment is shown in figure 34.

3.18.2.1 *Measuring conditions*

a) Test channel: the centre channel in the first i.f. band.
b) Test signal level: –45 dB(mW).
c) Video test signal: two, five or eight riser staircase signal.
d) Energy dispersal signal: present.
e) All other measuring conditions are standard (see 2.5).

3.18.2.2 *Measurement procedure*

a) Apply the i.f. signal modulated with the specified video signal to the unit under test at an input signal level of –45 dB(mW) and measure the peak-to-peak amplitudes of the video signal and the energy dispersal signal at the video output.

b) Calculate the ratio of the video signal level to the energy dispersal signal level.

3.18.3 *Presentation of results*

The results shall be expressed in decibels.

3.19 **Power supply for outdoor unit**

3.19.1 *Introduction*

This test measures supply voltage for an outdoor unit when the tuner unit is designed to provide this supply.

3.19.2 *Method of measurement*

Measurement shall be made according to the following conditions and procedure. Arrangement of the test equipment is shown in figure 35.

3.19.2.1 *Measuring conditions*

a) Test channel: the centre channel in the first i.f. band.

b) Mains voltage: nominal and ±10 %.

c) Load current for outdoor unit: 0 mA, 100 mA, 200 mA and 300 mA and any others in accordance with the tuner unit manufacturer's specification.

3.19.2.2 *Measurement procedure*

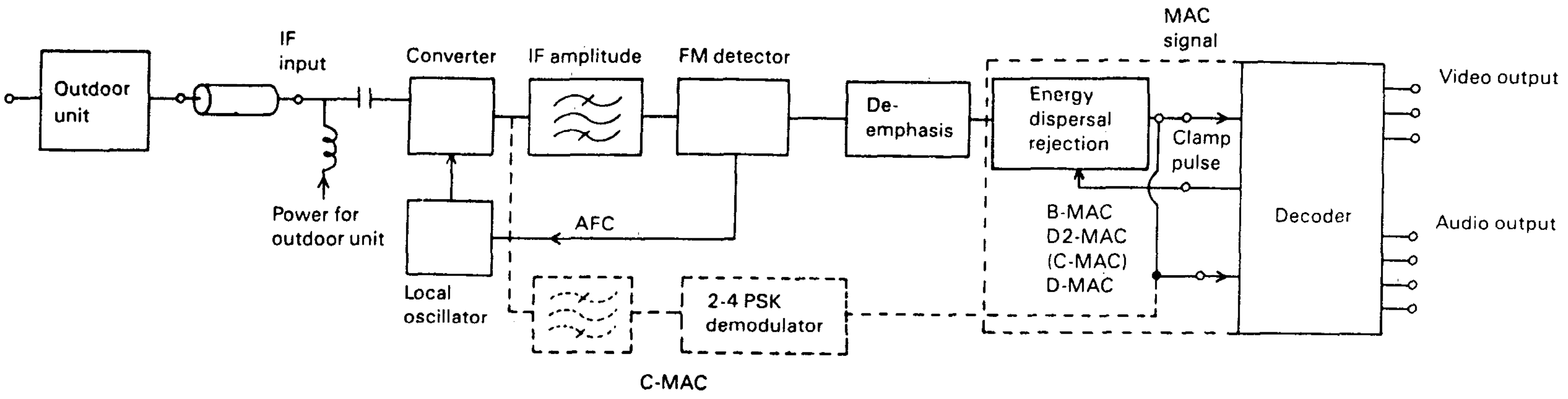
a) Adjust mains voltage to the centre of the range of rated values.

b) Measure the output voltage appearing at the relevant terminal under the specified load current conditions.

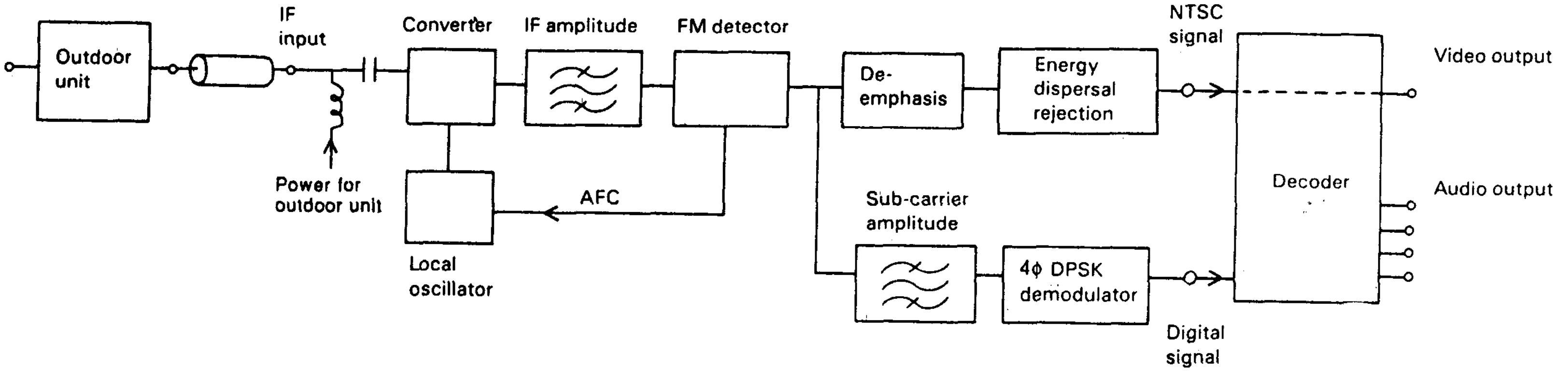
c) Repeat b) at other mains voltage values.

3.19.3 *Presentation of results*

The results shall be listed in a table or presented graphically.

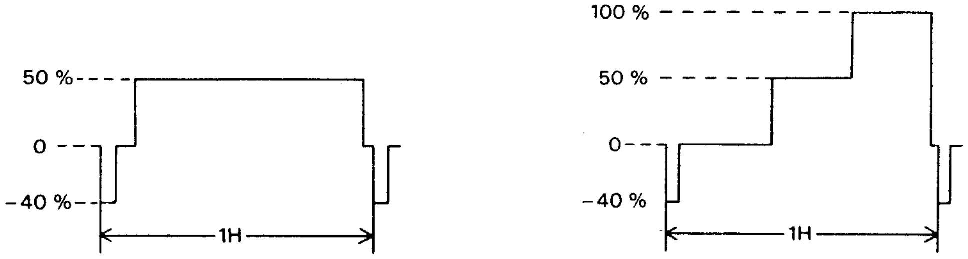


a) MAC systems

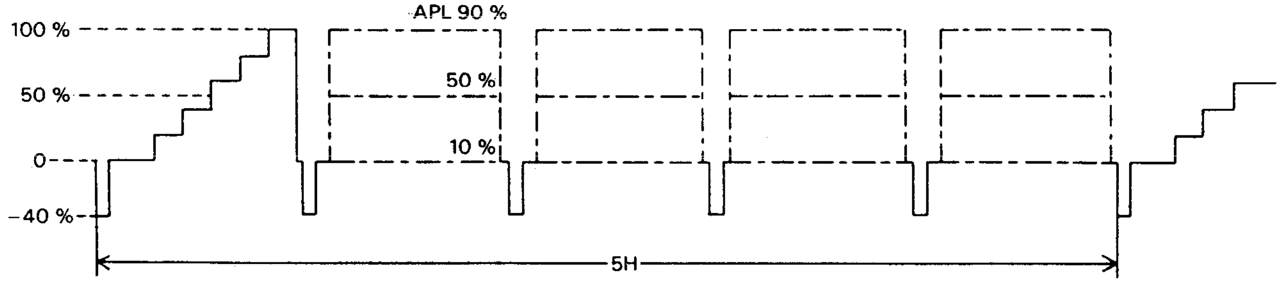


b) Digital sub-carrier/NTSC system

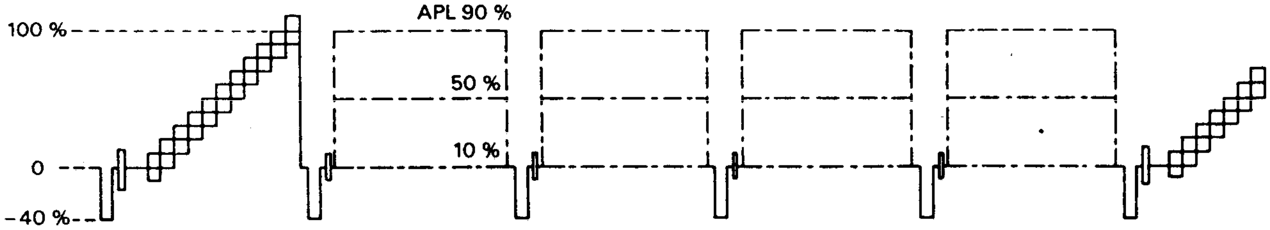
Figure 1 – Notional block diagrams of DBS tuner units interfaced with outdoor units and decoders



a) Grey signal b) Two riser staircase signal

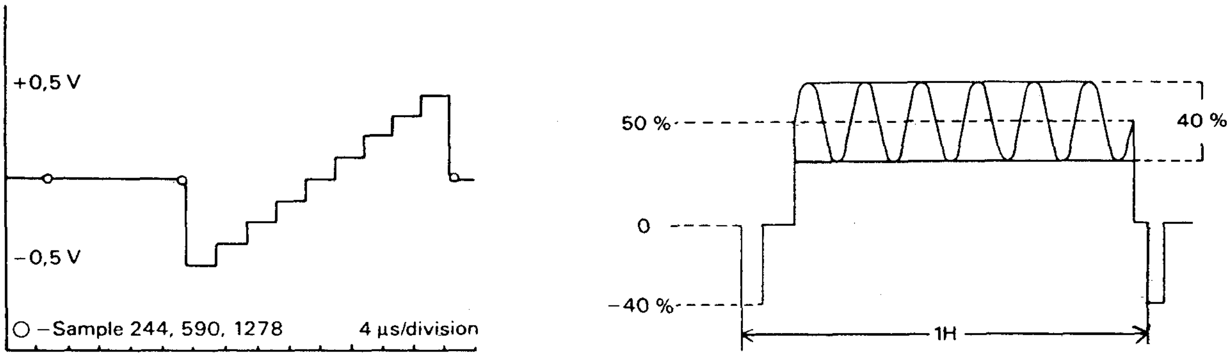


c) Five riser staircase signal



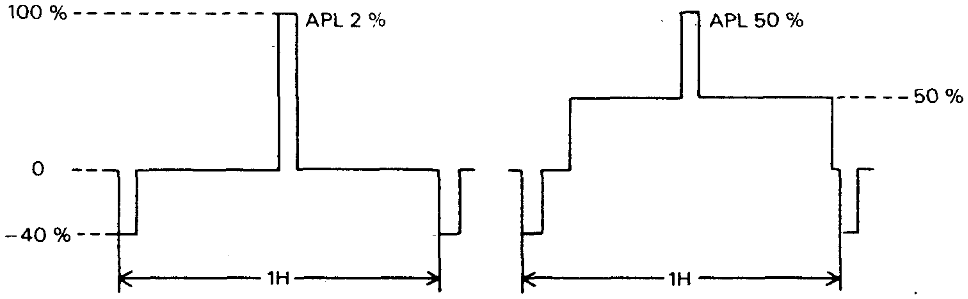
d) Ten riser staircase signal with colour sub-carrier (NTSC)

Figure 2 – Examples of video signals



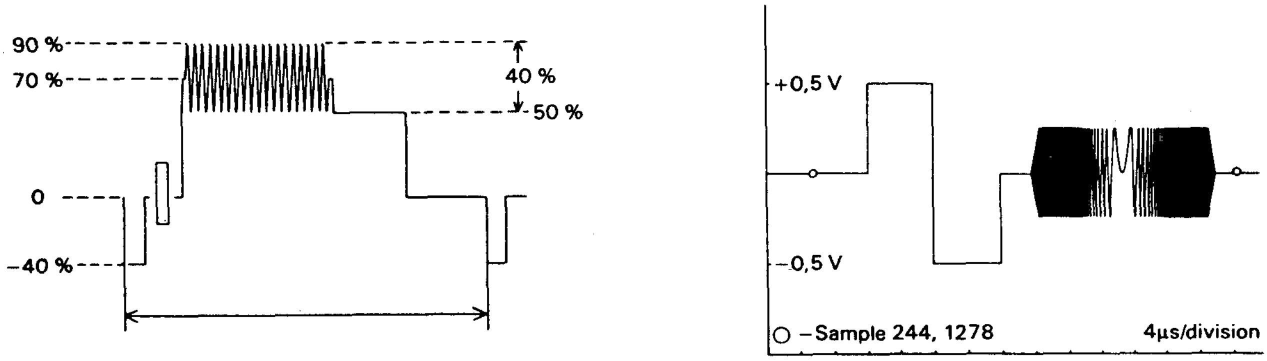
e) Eight riser staircase (MAC)

f) Composite sinewave signal



g) Pulse signal

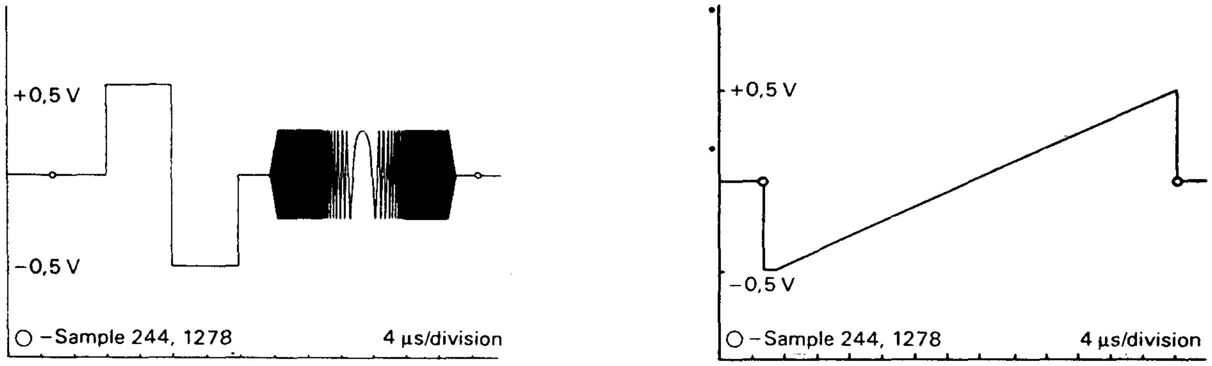
NOTE – Peak pulse level 90 % to 140 % variable.



h) VIR signal (NTSC)

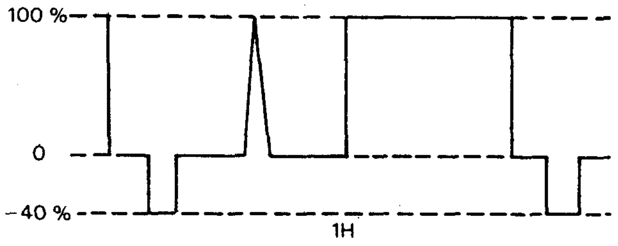
i) Complex wobbulation, imaginary part (MAC)

Figure 2 – (continued)

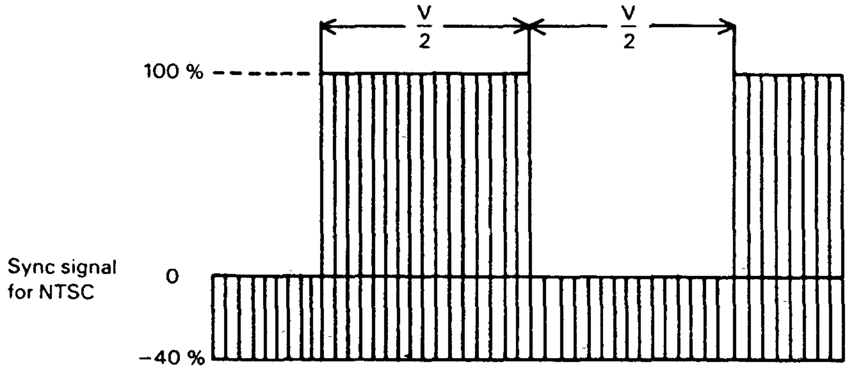


j) Complex wobbulation real - part (MAC)

k) Rising ramp (MAC)

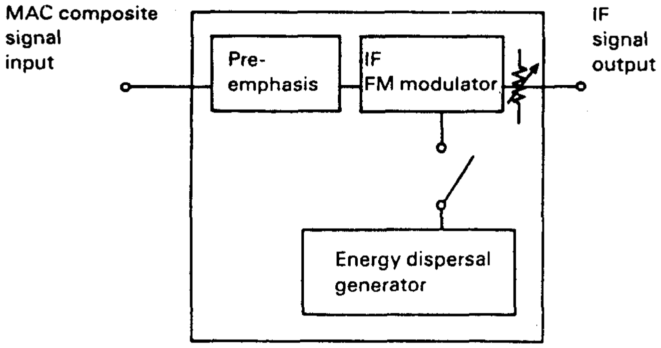


l) Pulse and bar signal
Sync pulse omitted when applied to MAC coder

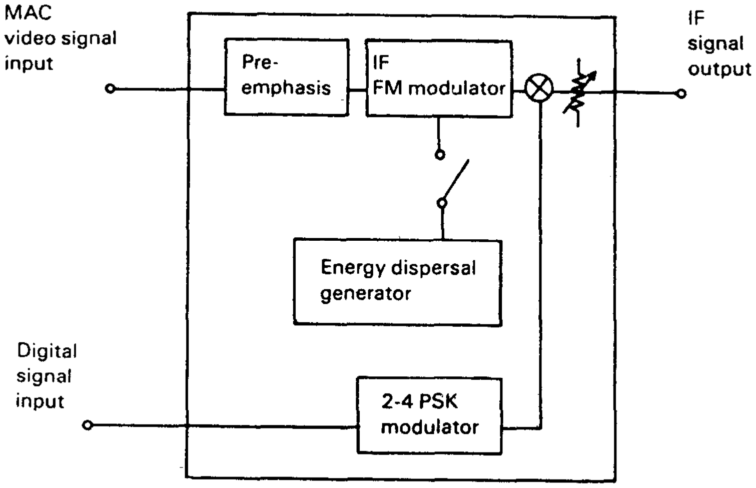


m) Field frequency square wave signal

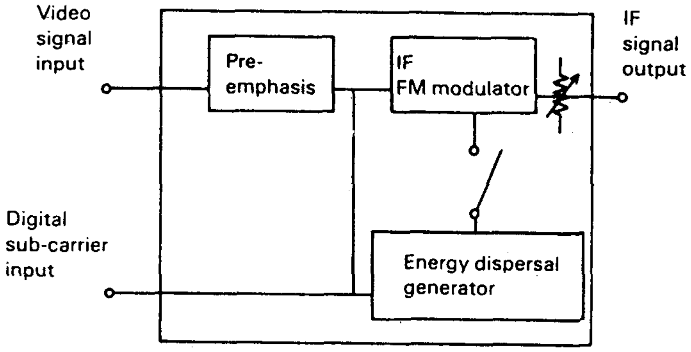
Figure 2 – (concluded)



a) B-MAC, D2-MAC and D-MAC systems

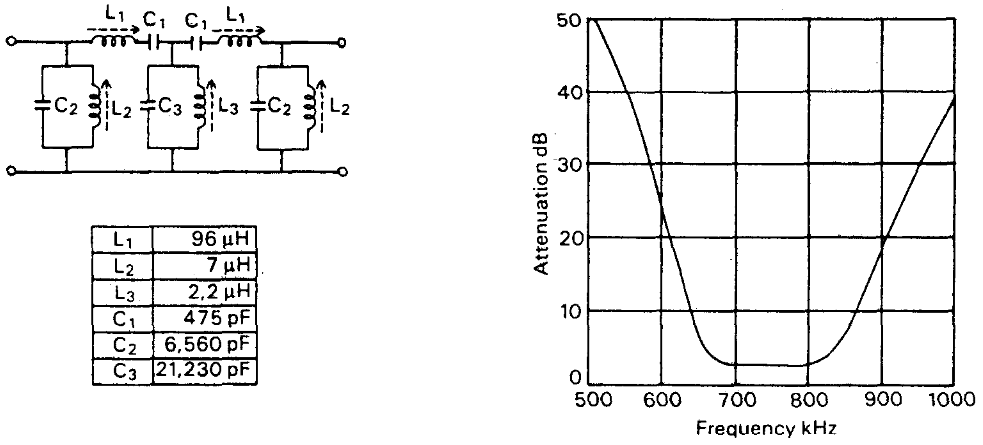


b) C-MAC system



c) Digital sub-carrier/NTSC system

Figure 3 – Notional block diagrams of the first i.f. modulators for measuring DBS tuner units

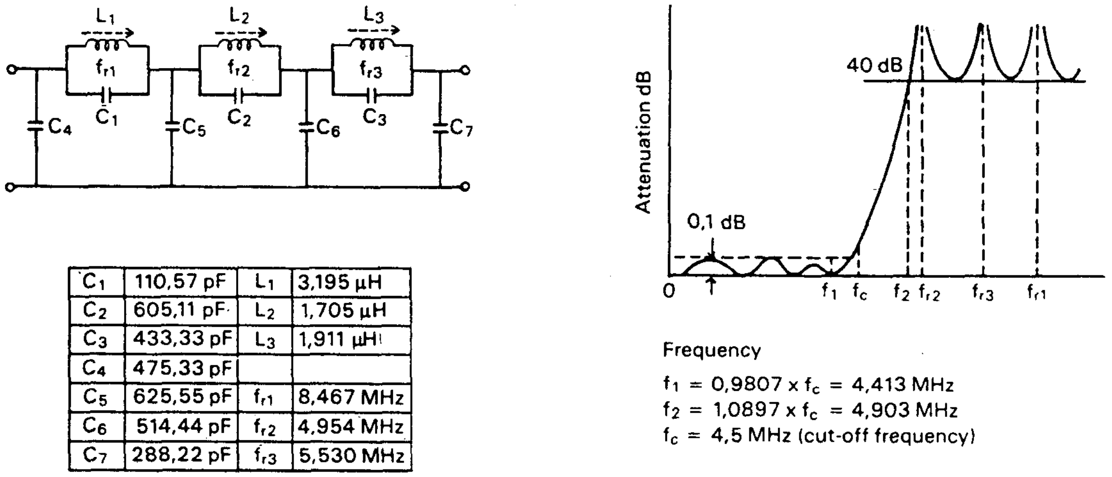


L_1	96 µH
L_2	7 µH
L_3	2,2 µH
C_1	475 pF
C_2	6,560 pF
C_3	21,230 pF

a) Circuit

b) Frequency characteristics

Figure 4 – Example of bandpass filter for measurement of interference



C_1	110,57 pF	L_1	3,195 µH
C_2	605,11 pF	L_2	1,705 µH
C_3	433,33 pF	L_3	1,911 µH
C_4	475,33 pF		
C_5	625,55 pF	f_{r1}	8,467 MHz
C_6	514,44 pF	f_{r2}	4,954 MHz
C_7	288,22 pF	f_{r3}	5,530 MHz

Frequency

f_1 = 0,9807 x f_c = 4,413 MHz
f_2 = 1,0897 x f_c = 4,903 MHz
f_c = 4,5 MHz (cut-off frequency)

a) Circuit

b) Frequency characteristics
(according to CCIR Recommendation 421-1, Annex II)

Figure 5 – Example of 4,5 MHz low pass filter (NTSC)

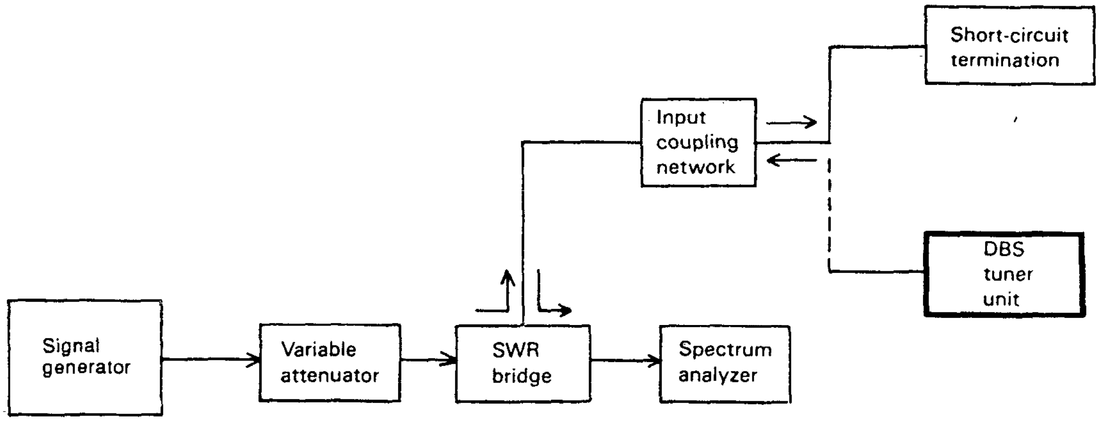


Figure 6 – Circuit arrangement for the measurement of impedance matching at input terminal

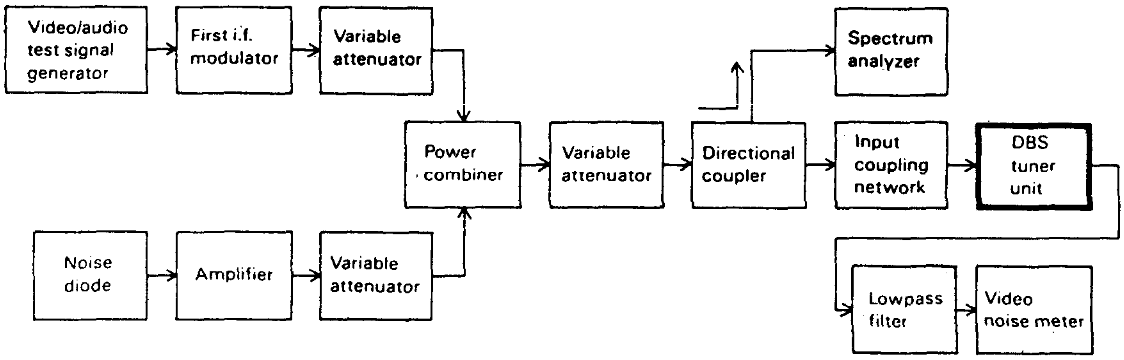


Figure 7 – Circuit arrangement for the measurement of signal-to-noise ratio of video signal

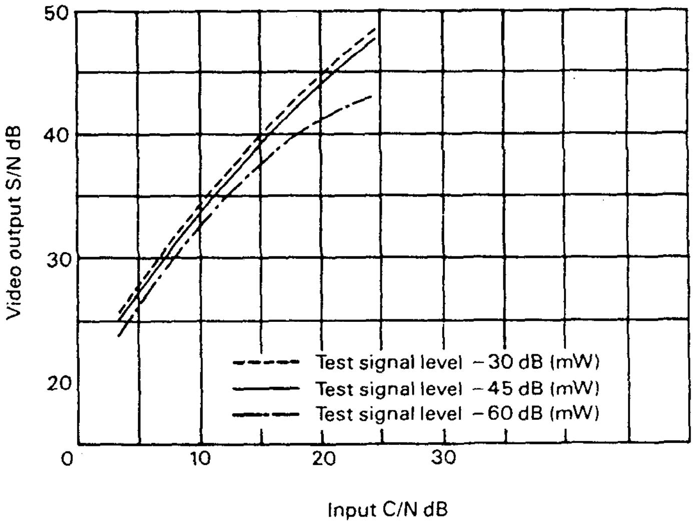


Figure 8 – Example of unweighted signal-to-noise ratio of video signal

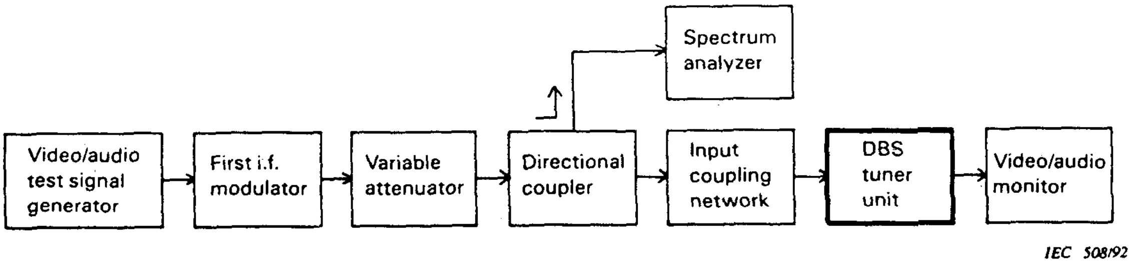


Figure 9 – Circuit arrangement for measurement of truncation noise

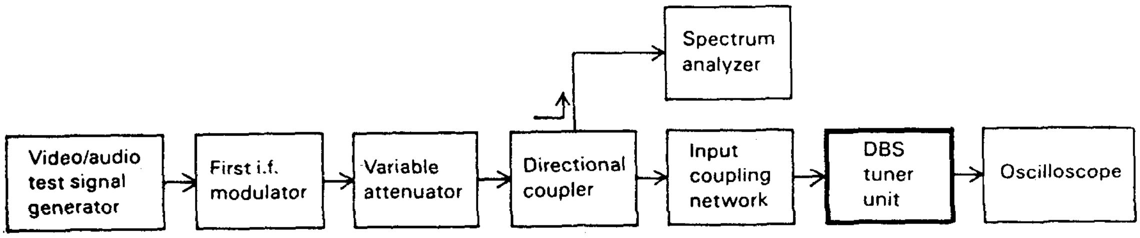


Figure 10 – Circuit arrangement for measurement of input signal level to output signal level characteristics

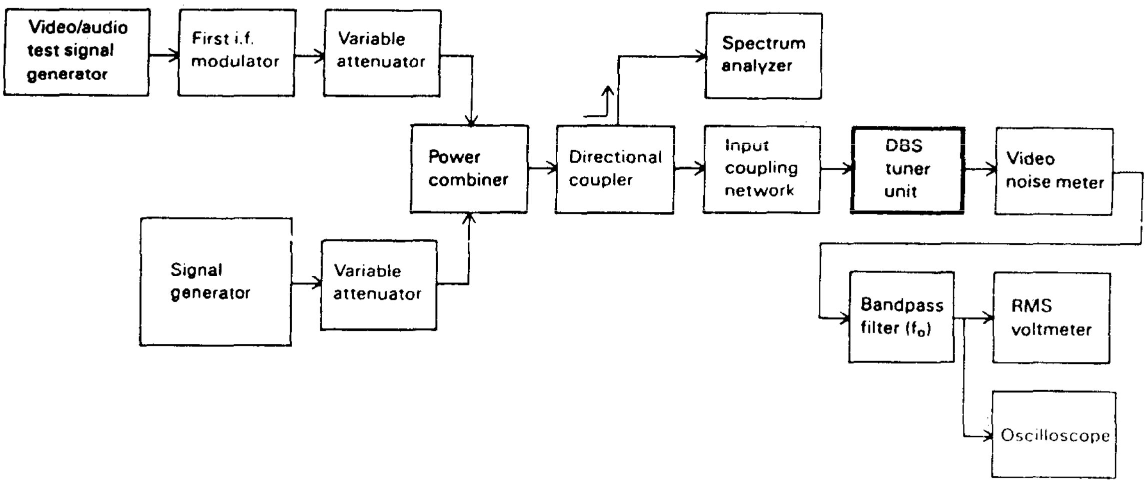


Figure 11 – Circuit arrangement for measurement of co-channel c.w. interference ratio

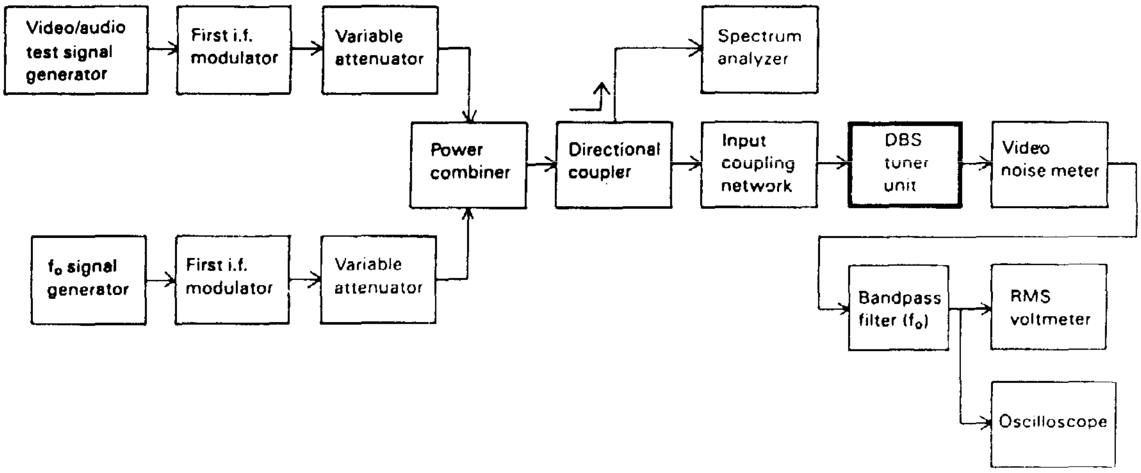


Figure 12 – Circuit arrangement for measurement of adjacent channel interference ratio

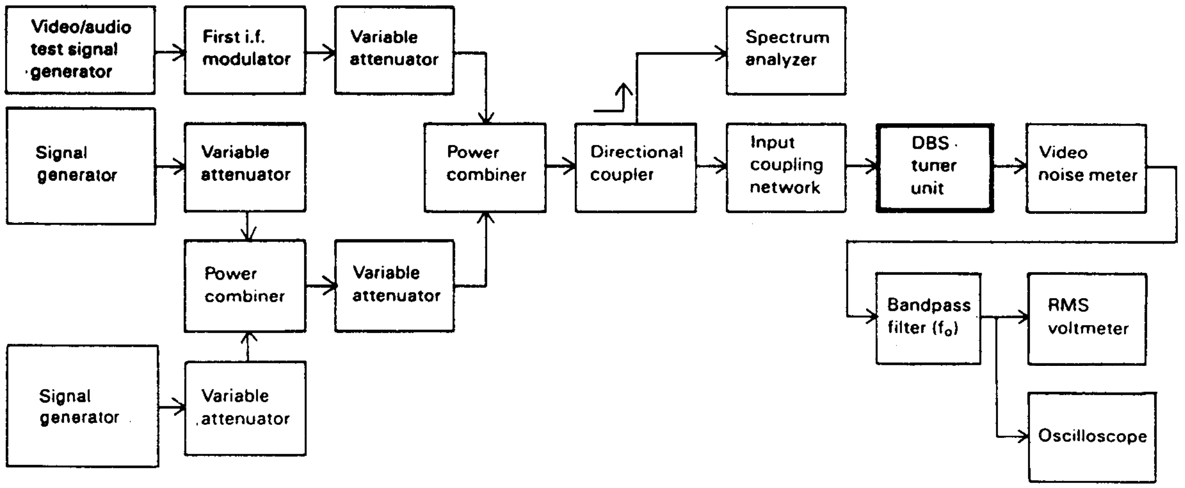


Figure 13 – Circuit arrangement for measurement of intermodulation interference ratio

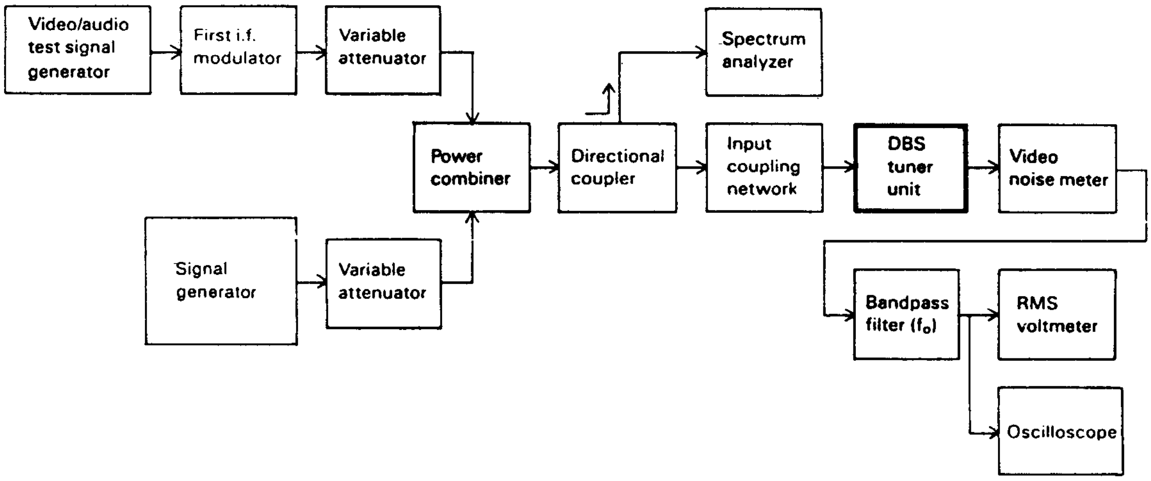


Figure 14 – Circuit arrangement for measurement of image frequency interference ratio - second i.f.

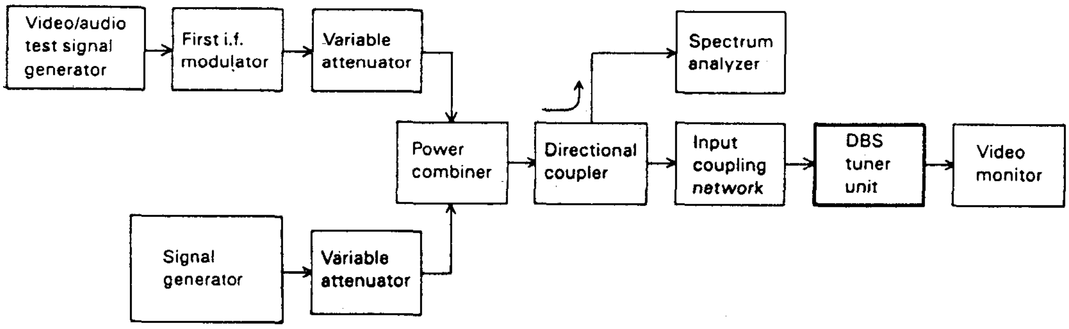


Figure 15 – Circuit arrangement for measurement of spurious response

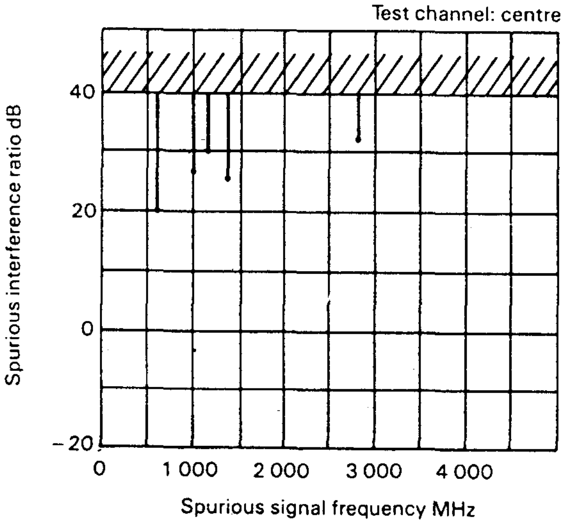
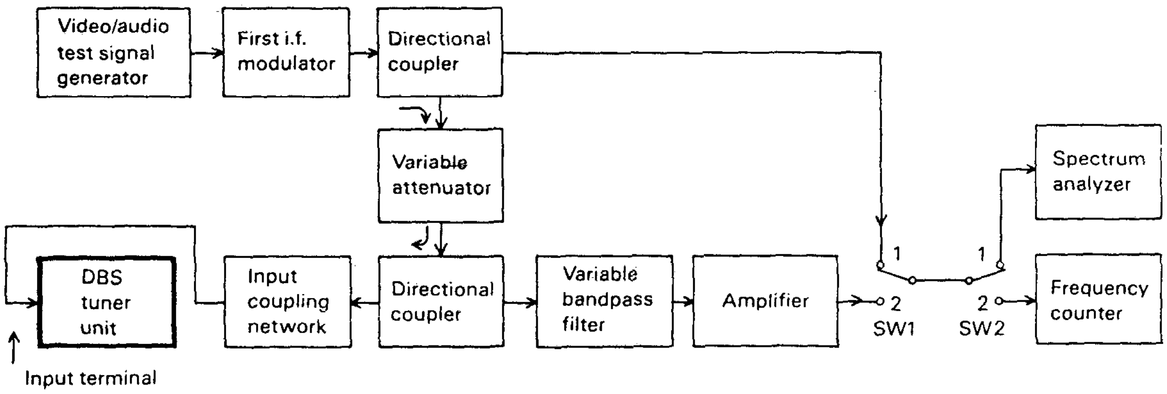


Figure 16 – Example of spurious response



NOTE - The amplifier should have a frequency band to cover the frequency range of the second local oscillator and a gain of about 50 dB.

Figure 17 – Circuit arrangement for measurement of stability of local oscillator frequency

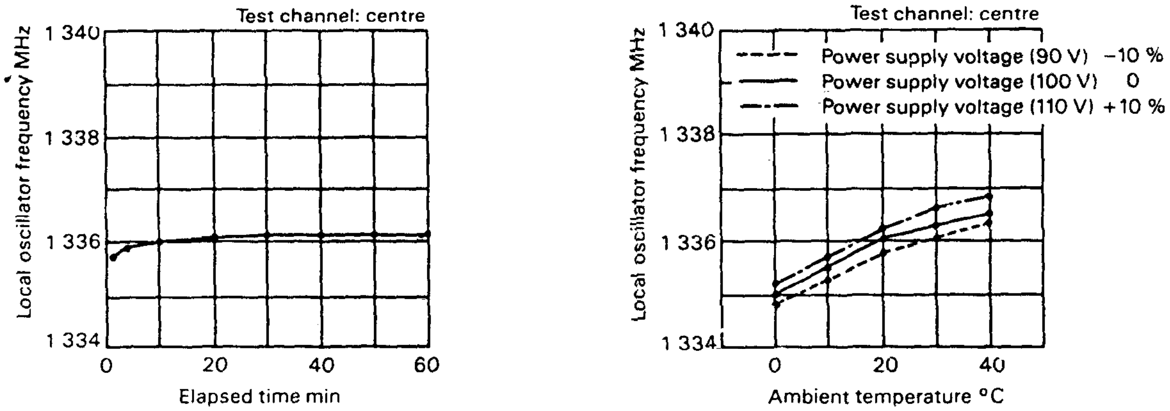
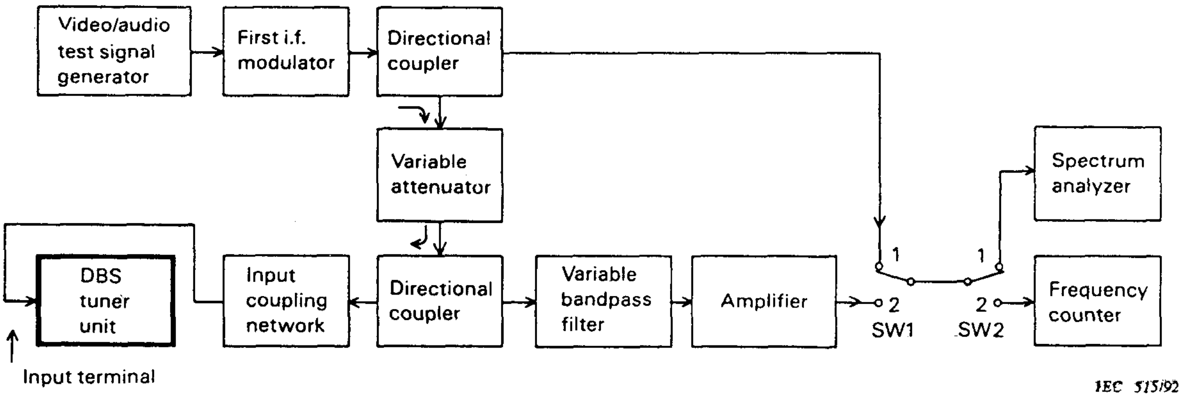


Figure 18 – Example of stability of local oscillator frequency



NOTE - The amplifier should have a frequency band to cover the frequency range of the second local oscillator and a gain of about 50 dB.

Figure 19 – Circuit arrangement for measurement of AFC characteristics

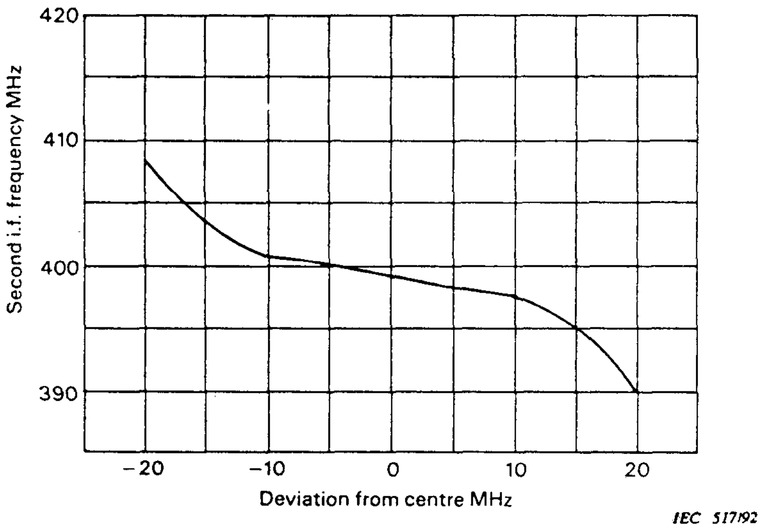


Figure 20 – Example of AFC characteristics

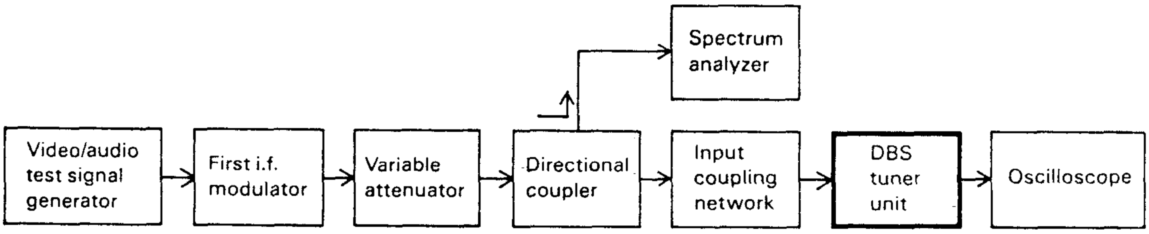


Figure 21 – Circuit arrangement for measurement of amplitude/frequency response of video channel

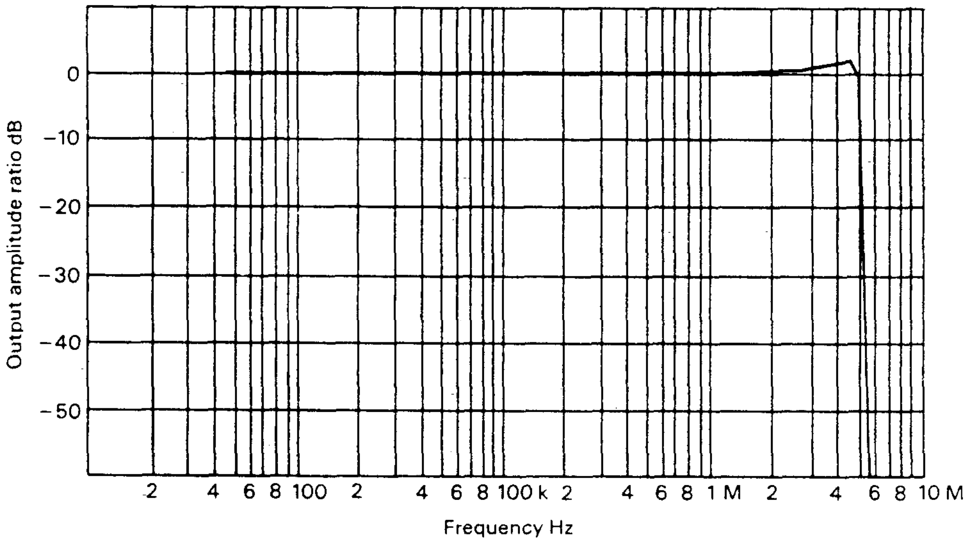
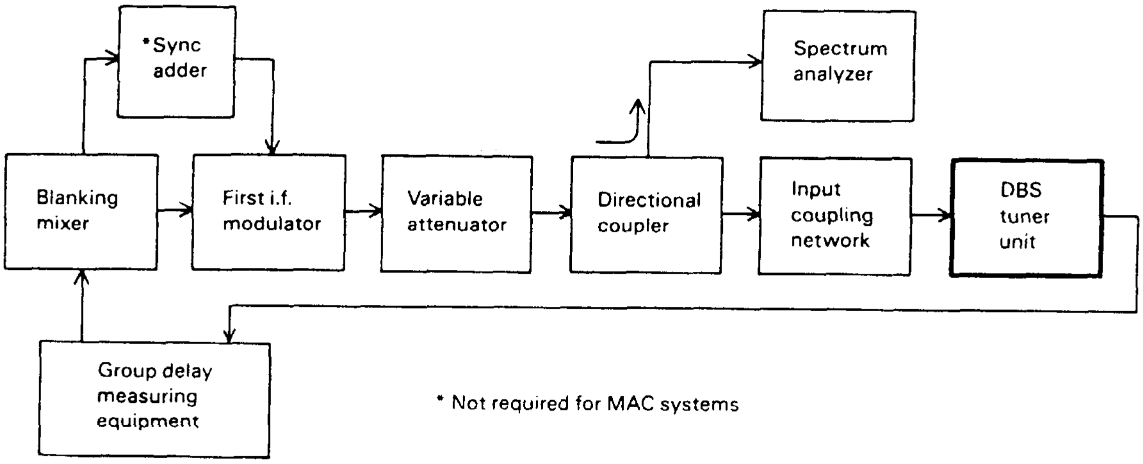


Figure 22 – Example of amplitude/frequency response of video channel



* Not required for MAC systems

Figure 23 – Circuit arrangement for measurement of the group delay characteristics of video channel

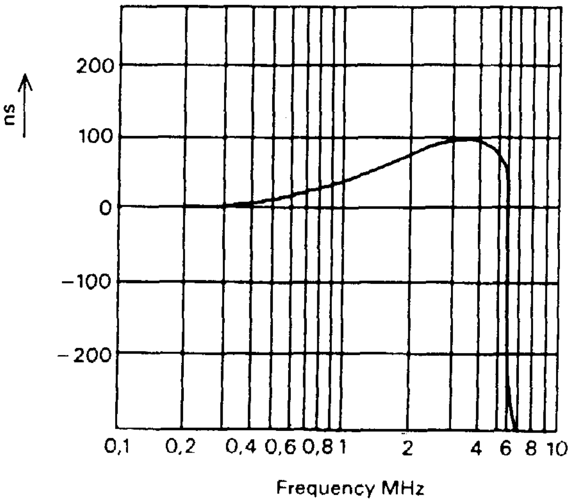


Figure 24 – Example of group delay characteristics of video channel

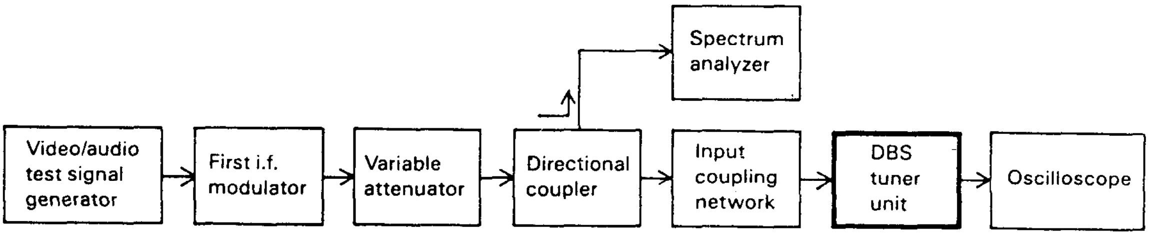
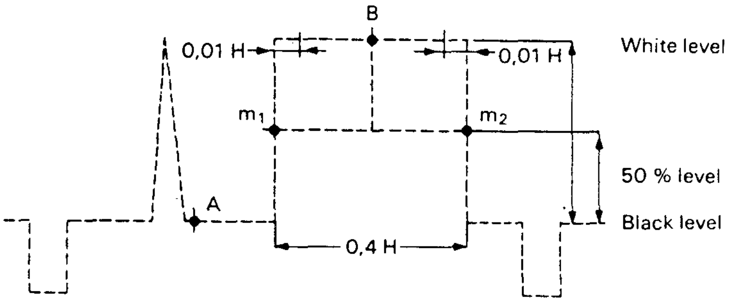


Figure 25 – Circuit arrangement for measurement of linear waveform response of video channel



H = line period
A = point at black level
B = mid-point measured between m_1 et m_2

Figure 26 – Bar response and pulse-to-bar ratio

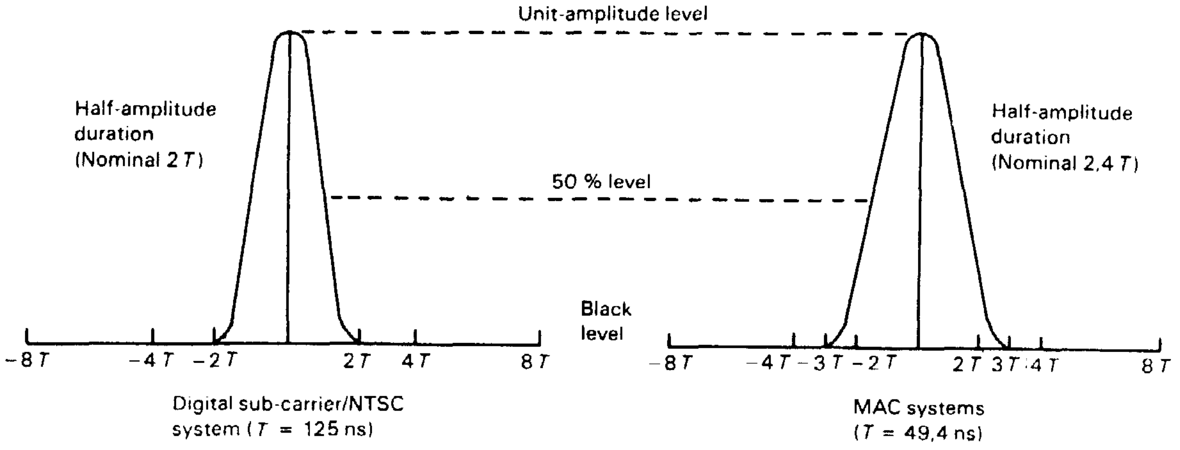

Unit-amplitude level
Half-amplitude duration (Nominal 2 T)
50 % level
Half-amplitude duration (Nominal 2,4 T)
Black level
-8 T
-4 T
-2 T
2 T
4 T
8 T
-8 T
-4 T
-3 T
-2 T
2 T
3 T
4 T
8 T
Digital sub-carrier/NTSC system (T = 125 ns)
MAC systems (T = 49,4 ns)

Figure 27 – Pulse response

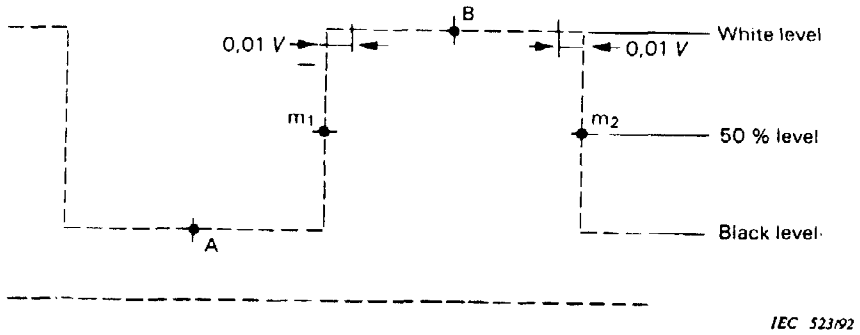


Figure 28 – Field frequency square wave response

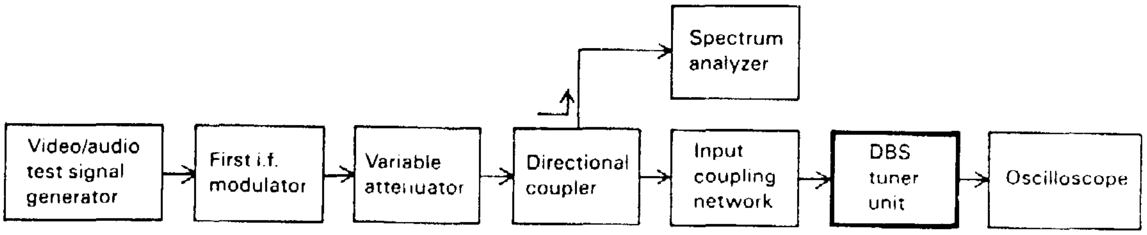


Figure 29 – Circuit arrangement for measurement of line time amplitude linearity of video signal

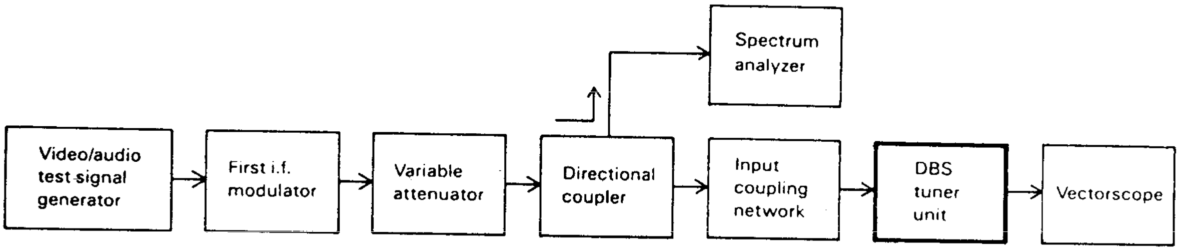


Figure 30 – Circuit arrangement for measurement of differential gain and differential phase characteristics with respect to the chrominance sub-carrier in the digital sub-carrier/NTSC system

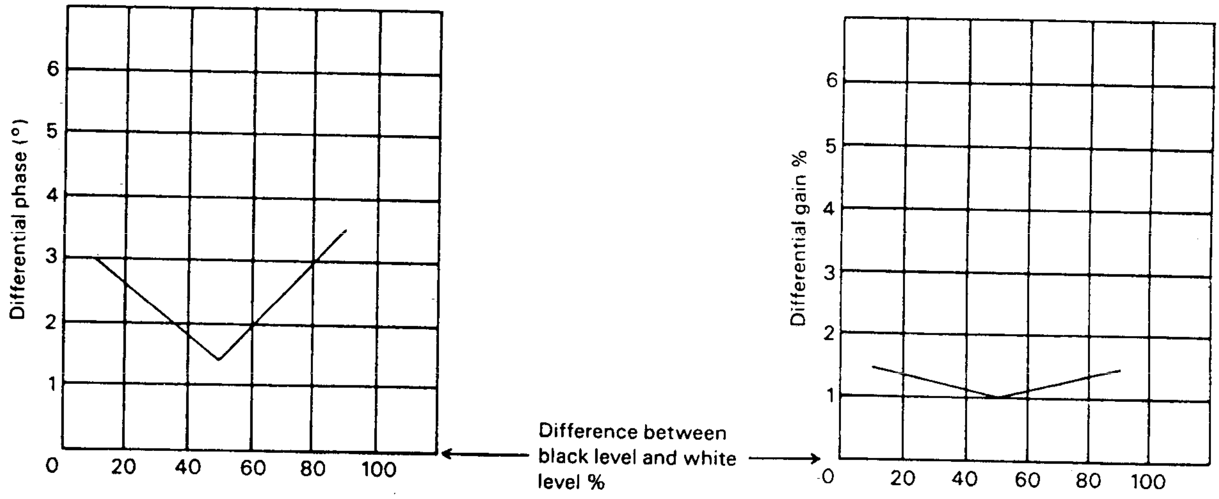


Figure 31 – Examples of differential gain and differential phase characteristics with respect to the chrominance sub-carrier in the digital sub-carrier/NTSC system

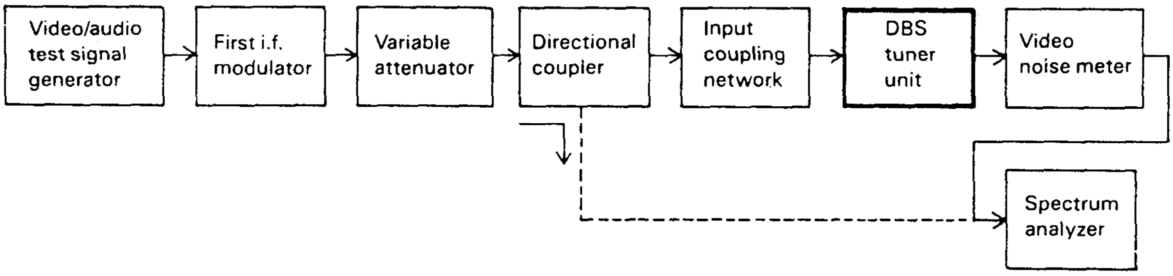


Figure 32 – Circuit arrangement for measurement of intermodulation between sound sub-carrier and chrominance sub-carrier in the digital sub-carrier/NTSC system

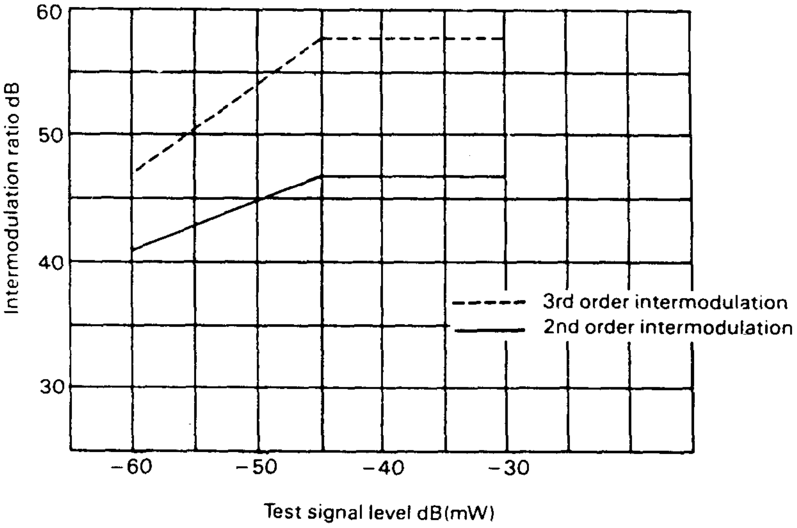


Figure 33 – Example of intermodulation between sound sub-carrier and chrominance sub-carrier in the digital sub-carrier/NTSC system

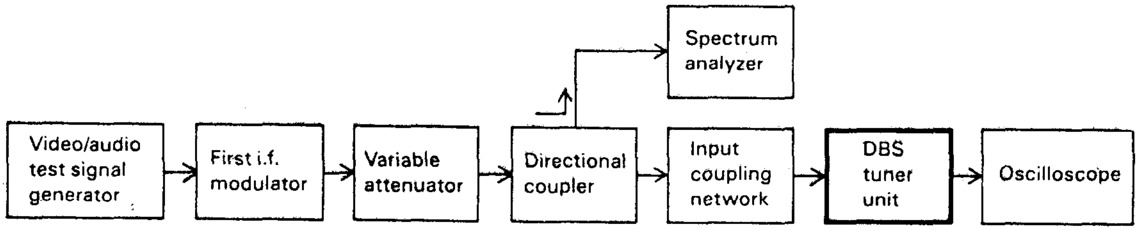


Figure 34 – Circuit arrangement for measurement of suppression of energy dispersal signal

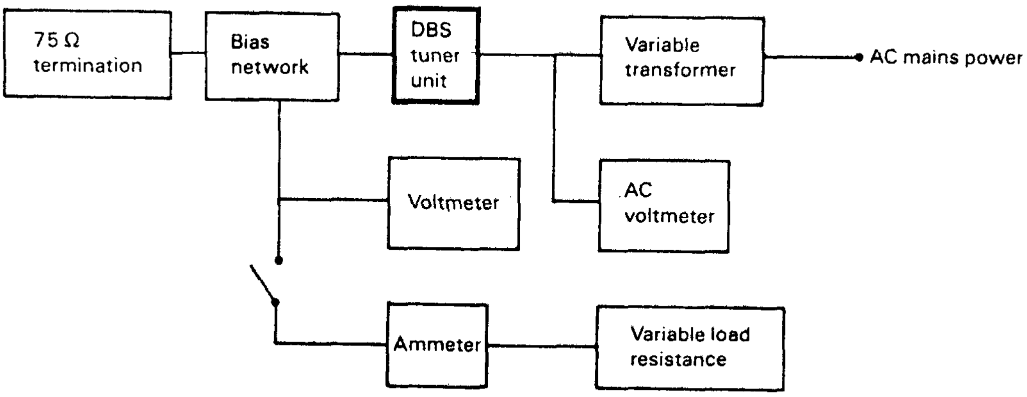


Figure 35 – Circuit arrangement for measurement of supply voltage for outdoor unit

Annex A

(informative)

Bibliography

The following publications contain useful information that is relevant to the subject of this standard.

At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent edition of any publications indicated below.

NOTE - CCIR Publications may be obtained from the International Telecommunications Union, Sales Office, Geneva, Switzerland.

[1] CCIR Recommendation 650-1: 1990, Television standards for satellite broadcasting in the channels defined by WARC BS-77 and RARC SAT-83.

[2] CCIR Report 1073-1: 1990, Television standards for the broadcasting-satellite service.

[3] CCIR Report 634-4: 1990, Broadcasting-satellite service (sound and television).
Measured interference protection ratios for planning television broadcasting systems.

[4] CCIR special publication: 1986, Specification of transmission systems for the broadcasting-satellite services.

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